A STUDY OF PRIME RATES IN HONG KONG

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ABSTRACT

Prime Rate has been, and continues to be, an important indicator in the financial market and overall economy in Hong Kong. A large portion of loans and advances from banks to customers are charged on a prime rate plus basis. Hence the fluctuation and level of the prime rate is of much interest to many people. The authors wish to conduct an in-depth study of the Hong Kong Prime Rate, its relationship to other rates, and the factors (both local and foreign) affecting it.

In this project, the basic background and the mechanism of the Prime Rate determination is covered first. Then there is a short session on the literature survey on the theory of interest rates. After that, the relationship between prime rate and deposit rates, interbank rates, and foreign interest rates is analysed. As expected, it is found that there is very high correlation among them. Following this is a verification of some general theories of interest rates by means of Hong Kong data. It is found that Hong Kong is neither a fully opened nor a completely closed economy, and even their general model is not too applicable to the Hong Kong case. Thus finally, a 'better' tailor-made model is formulated to correlate and forecast the

prime rate. It is not the objective of the authors to invent a new theory, but is to find a model that better explains the profile of the prime rate in Hong Kong.

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We wish to express our sincere gratitude to Dr. Danny Wong, who, graciously consented to act as our advisor, for providing inspiration and guiding the development and completion of this research project.

We must also thank Mr. George Hui, former lecturer of the MBA Division, for his constructive suggestions and invaluable comments to our study.

Needless to say, we are responsible for the views expressed in this report, and for whatever factual and analytical errors that may exist.

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CHAPTER 1

RESEARCH OBJECTIVES

1.1 Introduction

Hong Kong is an international financial and business centre. Everyday thousands of transactions involving money e.g. loans, deposits, advances, credit etc. are dealt. Lenders or depositors gain interest as a return in their money lent out, while borrowers have to pay interest as the cost of their capital borrowed. Both parties have great concern on how high this interest rate is, and its movement will directly affect their choice in putting money in the various investment opportunities. Hence interest rate is an important entity for the finance and economy of the Hong Kong society.

There are a number of popular interest rates prevailing in Hong Kong. There are lending rates, deposit rates, inter-bank rates, bond rates, discount rates (for bills) etc. All these can be classified into 2 streams : rates for lending, and rates for borrowing. Banks usually take the intermediary position for such transactions.

Banks get their money source mainly through (i) capital from shareholders, (ii) customer deposits, and (iii) inter-

bank loans. For customer deposits the banks need to pay deposit interest, the rate of which is governed by an interest rate agreement among banks. While for interbank loans, they have to pay an interbank loans interest which depends on market supply and demand. For loans extended to customers, the usual interest rates charged are based either on prime-plus or interbank-plus criteria. The amount of premium added is dependent on the risk, credit-worthiness and a no. of other factors. Usually Hong Kong and Shanghai Bank (HKSB) and some local banks have larger customer deposit bases, and this provides a cheaper source of fund since deposit rates are usually lower than the interbank rates. However most international banks in Hong Kong do not have such a large customer deposit bases. Hence these banks rely heavily on the interbank market for a large portion of their funds. The interbank interest rate determines the cost of borrowing at call or short notice among banks in Hong Kong; and as long as the prime rate is above the interbank rate, it is still a profitable means of raising funds for doing business.

1.2 Hong Kong Prime Rate and The Association of Banks

Prime Rate is a term used in the U.S. and Europe, which

designates the lowest interest rate that banks can charge for loans extended to customers. In Hong Kong, its official term is 'Best Lending Rate'. It is a very important indicator in the financial market, especially to those who need loans and advances. Take for example, the interest charged on private real property mortgages are usually based on prime rate plus 1%. Hence if the prime rate is high, then the cost of borrowing is high, and people may elect not to purchase the property for the time being. This will create a strong influence on the economic activities level for the society.

In strict terms every bank can quote their own prime rates since there is no statutory requirement for a unique rate among banks in Hong Kong. However in practice they follow to a unique one unanimously. The usual leader in quoting the Best Lending Rate is the HKSB. They made their announcement of any change in their prime rate (and other banks follow suit) usually on Friday afternoon, which is the same time as the regular weekly meeting of the Hong Kong Association of Banks who reviews the deposit rates.

Actually the Hong Kong Association of Banks is a statutory entity whose membership comprises all licenced banks in Hong Kong. Its function is to regulate the exchange value

of the HK dollar, update and expanding banking rules, monitor the implementation of interest rate agreement, reviews the operating environment of banks etc. It also has a consultative council from representatiaves of foreign and local banks so that banks from different parts of the world have a fair chance to voice their suggestions and opinions about the banking sector or monetary affairs of Hong Kong. It is also responsible for prescribing a uniform deposit rate structure for all the licensed banks through an interest rate agreement which is designed to prevent any unfair competition in the financial market, larger banks cannot outcompete smaller ones by virtue of their size or by offering higher deposit rates.

1.3 Scope of Study

In this project an in-depth research on the Hong Kong Prime Rate was conducted from an viewpoint of a non-economist. Specifically, we will examine its relationship to other rates, verify the applicability of various theories in Hong Kong, and study factors affecting the Hong Kong prime rate.

Some theories on the interest rate determination were covered first. Then the research was divided mainly into 3

parts : (i) a study of its relationship with other rates (Chapter 3), (ii) verification of the theories with Hong Kong data (Chapter 4), and (iii) a study of the factors affecting it (Chapter 5).

1.3.1 Relationship to Other Rates

As described in Section 1.2, the Prime Rate is very much related to both the deposit rate and the interbank rate. Reason for the choice of these 2 rates are because they are the major ingredients of the cost of getting fund for the banks to do business. In fact a very close relationship between them can be located by examining their profile of movement over time.

Since Hong Kong is an international financial centre, the Hong Kong Prime Rate is also affected (or in other words is led) by the foreign interest rates. Since the U.S. is the world's largest financial market, hence some popular interest rates are studied.

1.3.2 Verification of Theories

The various theoretical approaches mentioned in Chapter 2 are to be verified with Hong Kong historical data. Many

scholars used data of other countries e.g. U.S.A., Singapore, Columbia etc. to validate their model. It is intended to get some data here to see whether they can be applicable in Hong Kong or not.

1.3.3 Factors Affecting The H.K. Prime Rate

There are a number of local and external factors that may influence the Hong Kong Prime Rate. The general model developed by other scholars are not too applicable in Hong Kong. Hence it is intended to locate these appropriate factors and to formulate a good regression model to explain the Hong Kong Prime Rate.

CHAPTER 2

Theoretical Aspects of Interest Rate

Prime Rate is one of the many interest rates prevailing in Hong Kong and hence a literature survey on the theoretical aspects can give us a better 'feel' of how they are determined. Basically we can use supply and demand concept to explain most of the phenomenons. Usually these theories can explain well for the long run behaviour and when supply and demand are close to the equilibrium point. In practice, short term fluctuation (due to government intervention, short run fund flow resistance etc.) do occur, and sometimes may render these theoretical inferences inaccurate.

2.1 Loanable Fund Theory[1]

Some scholars treat interest rates in a similar way as prices, which are determined by supply and demand. Referring to the economy of the society as a whole, including banks, business firms, and government, the fund flow among them are determined by a number of factors. Interest rate

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[1] Kaufman, George. Money, The Financial System and the Economy, 1983 Ed., pp 166 to 169

is one of them. If we concentrate on the demand and supply of loanable funds, then we have :

The demand for fund, DM = BI + CI + CN + FD
where :

BI - business investment
CI - consumer investment
CN - consumer non-durable credit purchase
FD - deficits in federal & budgets

The supply of fund, SM = BS + CS + CM + LS
where :

BS - business retained earnings & depreciation
CS - consumer savings
CM - reduction in money balance of consumer
LS - reduction in money balance of federal budget

In times of equilibrium, DM = SM.

Since all the variables mentioned above has some degree of relation with the interest rate hence there should be a single point (F_o, i_o) which satisfies this condition. And i_o is the equilibrium interest rate. Please refer to Figure 1. In order to measure this i_o, we firstly have to find the mathematical function of each of the above supply and demand terms, then find the aggregate, and finally solve for the solution.

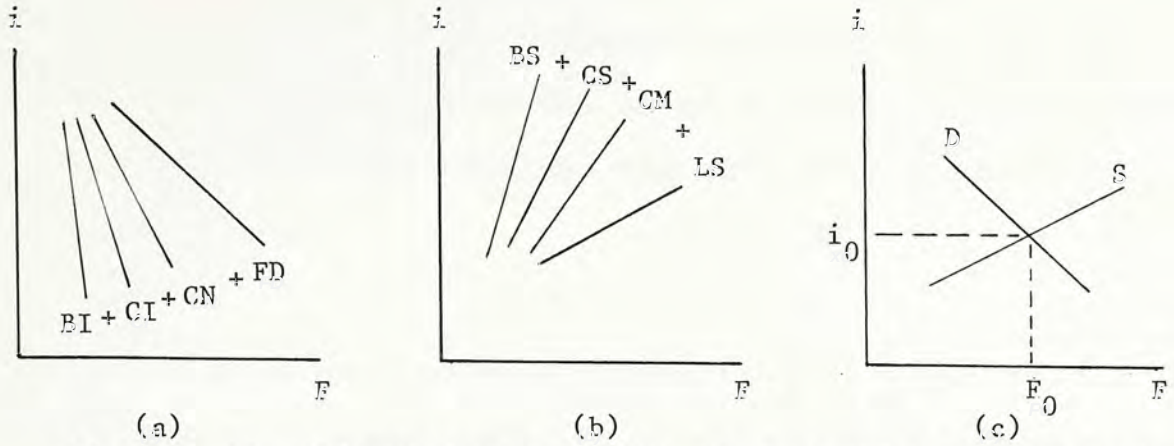

Fig. 1 Graphical Presentation of Loanable Fund Theory

2.2 Fund Flow Of Banks

Since the Hong Kong prime rate is set by the banks, it appears quite reasonable to examine the fund flow of bank rather than for the whole society since they are the market maker. Hence along with this line of thought, the model described in Section 2.1 above will not be very appropriate. Please refer to Fig 2.

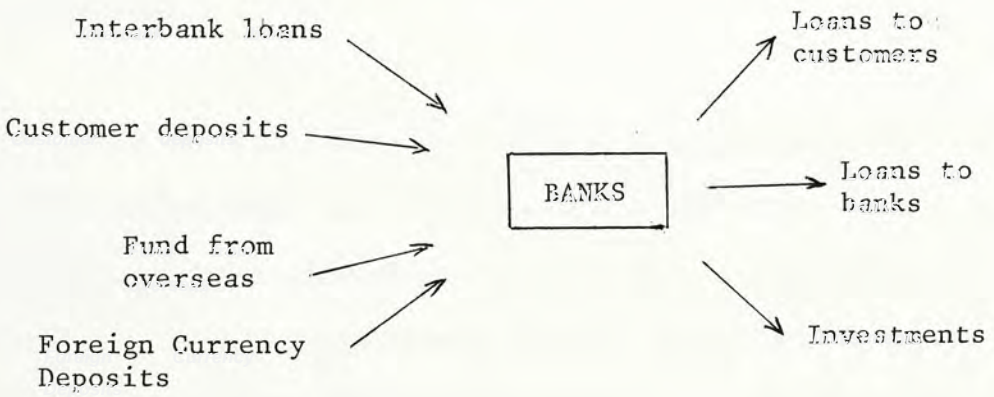

Fig. 2 Diagram Showing Fund Flow of Banks

The bank takes the intermediary position for the flow of money. They can alter the level of their controllable interest rates to regulate the fund flow quantity as well as direction.

Inflow of money includes interbank loan (affected by the interbank interest rate), customer deposit (affected by the deposit rates), funds from overseas (affected by the differential in interest rates domestically and externally) and foreign currency deposit (affected by both the interest rate differential as well as the exchange rate expectation).

While for the outflow, it consists of loans to customer (affected by the lending rate which is based on prime plus or interbank plus), loans to banks (affected by the interbank rate) and investment (affected by profit opportunity).

The values of the various factors e.g. interbank rate, deposit rates etc. will influence each other and also would affect the status of the fund for each bank. Hence there are some points where these rates can settle at an equilibrium. The inter-relationship among them are further explored in Chapter 3.

2.3 Fisher's Approach of Interest Rate[2]

Fisher studied the interest rates in a closed economy, i.e. there is neither trade nor capital movement in and out, and is completely isolated from the rest of the world. He found that the nominal interest rate would be given by the sum of the real interest rate and the expected rate of inflation. Represented in mathematical form:

$$i_t = rr_t + \pi^e_t \qquad \ldots\ldots (1)$$

where i_t = the nominal rate of interest

rr_t = the real rate of interest

π^e_t = the expected rate of inflation

The real interest rate, in turn, will depend on the liquidity conditions of the money market. In this setting increase in the real quantity of money will tend to result in decline in the real interest rate in the short run.

Thus Equation (1) is transformed to:

$$rr_t = \rho - \lambda EMS_t + w_t \qquad \ldots\ldots (2)$$

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[2] Edwards & Khan, Interest Rate Determination in Developing Countries, IMF Staff Paper, Sep 85, pp 377 to 399

where ρ = constant = long term equilibrium real interest rate

EMS_t = excess supply of money

λ = a parameter

w_t = random error term

Further substituting EMS by other exogeneous variables, the final reduced-form equation for the nominal interest rate is :

$$i_t = \gamma_1 \log GNP_t + \gamma_2 \log M_{t-1} + \gamma_3 \; t + w_t \quad .... \; (3)$$

where GNP_t = real income

M_{t-1} = money supply, M1

2.4 Interest Rates in a Fully Open Economy[3]

If the economy is completely open to the rest of the world, and there are no impediments to capital flow, domestic and foreign interest rates should be closely linked. In particular, when there is no transaction costs, then

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[3] Edwards & Khan, Interest Rate Determination in Developing Countries, IMF Staff Paper, Sep 85, pp 377 to 399

$$i_t = i_t^* + \dot{e}_t \quad \ldots\ldots (4)$$

where i_t^* = world interest rate

$\dot{e}_t$ = expected rate of change of the exchange rate

There exists the possibility that because of frictions arising from transactions costs, information lags etc., domestic interest rate respond with delay to any changes in the foreign rate of interest or in exchange rate expectations. This type of lagged respones can be adjusted by :

$$i_t = \theta (i_t^* + \dot{e}_t) + (1 - \theta) i_{t-1} \quad \ldots\ldots (5)$$

where θ = adjustment parameter, $0 \leq \theta \leq 1$

If the financial market adjusts rapidly, this parameter will tend toward unity. Conversely, a small value of θ would imply slow adjustment of the domestic interest rate to the foreign one.

2.5 The General Case[4]

The above two extreme cases of a fully open or completely closed economy are, in fact, seldom observed in the real world, and it is more realistic to consider the case of an

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[4] Edwards & Khan, Interest Rate Determination in Developing Countries, IMF Staff Paper, Sep 85, pp 377 to 399

economy, that, while not closed, nevertheless has some controls on capital movements. For such an economy it is likely that both open- and closed-economy factors will affect the movements in domestic interest rates. In essence, this would involve combining the two extremes into a general model in which the domestic nominal interest rate would depend on (1) conditions related to the level of liquidity in the domestic economy, (2) expected domestic inflation, (3) foreign interest rates, and (4) the expected rate of change in the exchange rate.

Factors (1) and (2), of course, are related to the closed-economy model described above, whereas factors (3) and (4) are related to the fully open economy model. The relative importance of these factors in the process of determining interest rates in developing countries will depend on the degree of financial openness of the economy in question, which describes the conditions under which capital movements actually take place. If the economy is financially very open, domestic interest rates will be much more strongly influenced by world interest rates and expected devaluation than by domestic factors. On the other hand, if the economy is quite closed, financially, the conditions related to domestic liquidity and expected inflation will be the dominant ones.

Hence let ψ be an index measuring the degree of financial openness of the society, then

$$i_t = \psi (i^*_t + \dot{e}_t) + (1-\psi)(rr_t + \pi^e_t) \quad \ldots\ (6)$$

where $0 \leq \psi \leq 1$

Substituting and converting into an reduced form,

$$i_t = \delta_0 + \delta_1 \log GNP_t + \delta_2 \log M_{t-1} + \delta_3 \pi^e_t + \delta_4 (i^*_t + \dot{e}_t) + \delta_5 i_{t-1} + \epsilon_t \quad \ldots\ (7)$$

here $\delta_4 = \psi\theta$, $\delta_5 = \psi(1-\theta)$

We can thus use actual Hong Kong data to find out the values of ψ and θ .

CHAPTER 3

Prime Rate and Its Relationship To Other Rates

3.1 Prime Rate Versus Deposit Rates

3.1.1 Deposit Rates in Hong Kong

Banks in Hong Kong are governed by an interest rate agreement[1] which limits the maximum interest rates paid for deposits from retail public due in more than 12 months. There are mainly 2 classes of banks : Class A comprises foreign banks (include HKSB); Class B comprises local banks. According to the interest rate agreement, Class A banks have to offer deposit rates at the agreed rates; while for Class B banks, there can be a little variation margin ($\sim$ 1/2 %) allowed so as to increase their competitive edge.

When banks lend out money which are obtained through retail deposits, they can earn the difference between the lending and depositing rates. This difference is called 'spread'. The minimum level of spread is to minus Prime Rate by the Deposit Rate.

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1 Asian Monetary Monitor, The Interest Rate Agreement - Who Benefits ? Nov/Dec 1984 pp8. And also from Sun Hung Kai Newsletter, Bank Sector : Sector Review Jun 1984

3.1.2 Model & Methodology

Month-end figures between Feb 81 to Dec 85 were analysed by the SAS program in the CUHK.

Among the various deposit rates the following rates were chosen as subjects of analysis:

W_1 = 7 days at call rate,

W_2 = 3 month fixed rate , and

W_3 = savings rate.

They were chosen because these 3 rates were the most popular deposit rates that contribute most of the customers' deposits.

Model is $Y = f(W_i)$, $i = 1,2,3$ where Y is the HK Prime Rate. A graphical plot of Y, W_1, W_2,& W_3 against time is shown in Appendix 1.

Reading from the graph we can see that the spread for Savings Rate is the largest, then 7 days at call, and 3 months the smallest. This spread is the minimum return to the banks as a result of the interest rate agreement because banks usually charge customer some extra premium to cover risk anticipated. Based on the spreads for Savings and 3 month at equal weights, the average spread for the

period under observation is 4.75 percentage points (please refer to the Table in Section 3.1.3 d).

3.1.3 Findings

a) The coefficients of determination (R^2) between Y and W_i's are shown in Table 3.1 below.[2]

Table 3.1 R^2 between Y and W_i's (i = 1,2,3)

Variable	Short Description	Correlation with Y	Line of Regression
W_1	7 days	0.9854	$Y = 4.513 + 1.137\ W_1$
W_2	3 month	0.9718	$Y = 3.941 + 0.985\ W_2$
W_3	savings	0.9931	$Y = 4.885 + 1.115\ W_3$

The Student's t-values of the coefficients of the above Regression Lines are all very high, well beyond 18.

b) The cross correlations among the W_i's are in deed very high, details of the Pearson Correlation Coefficients being shown in Table 3.2.

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2 All data obtained and presented in this project report are substantiated with their corresponding computer print-outs run by the Computer Centre of the CUHK. Copies of the print-outs are enclosed at the end of the Appendix Section (i.e. Appendix 7), and are filed according to the order of presentation in this report.

Table 3.2 Correlation among W_i's (i = 1,2,3)

	W_1	W_2	W_3
W_1	1.0000	0.9639	0.9976
W_2	--	1.0000	0.9774
W_3	--	--	1.0000

c) There is no time lagging effect among these rates. This can be illustrated clearly in Table 3.3 below since R^2 drop quickly with the increase in time lag.

Table 3.3 R^2 between Y & W_i's (i = 1,2,3) with Time Lags

Variable	Short Description	**** Correlation with Y **** no lag	1 month lag	2 mon. lag
W_1	7 days	0.9854	0.8088	0.6104
W_2	3 month	0.9718	0.7888	0.6126
W_3	savings	0.9931	0.8228	0.6322

Actually we can read from Appendix 1 that usually whenever there is a change in Y there is a corresponding change in W_i's. It is a common practice of the HKSB to adjust the prime rate immediately after the review of deposit rates by the Association of Banks.

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d) In order to measure volatility, the standard deviation, coefficient of variation and range of the variables were measured. Please refer to Table 3.4:

Table 3.4 Volatility Measures of Y and W_i's (i = 1,2,3)

Variable	Mean	Standard deviation	Coe. of variation	Range
Y	12.7542	3.4829	0.27	14.00
W_1	7.2458	3.0398	0.42	11.50
W_2	8.9492	3.4864	0.39	13.25
W_3	7.0551	3.1118	0.44	11.75

From the above tables, it is observed that:

i) there is very high correlation between the prime (Y) and the various deposit rates (W_i's)

ii) there is also very high correlation among the W_i's

iii) the standard deviations for the 4 variables are quite close; Y and W_2 have nearly the same std. deviation

iv) the coefficients of variation for W_i's are very close to one another, but not for Y. (because of bigger value of the mean)

v) the range of Y and W_2 are larger than that of W_1 and W_3 by 1.5 to 2.5 percentage points.

In the overall sense, Y and the W_i's are highly correlated. The fluctuation of Y and W_2 resemble very much in many aspects. In other words, the spread between them are very stable. W_1 and W_3 are slightly 'cushioned', and thus are a little bit less volatile.

3.2 Prime Rate Versus Interbank Rates

3.2.1 Interbank rate in Hong Kong

Interbank rate is a highly sensitive interest rate. Unlike Prime rate it is determined solely by market supply and demand. Hence its fluctuation reflects the free market situation of the fund flow in Hong Kong. The usual inter-bank rates are : 24-hours call, 7 days, 1 month, 3 months and 6 months.

For banks relying heavily on interbank loans, this interbank rate is very important to them because when this rate rises to a level higher than that they lend out their money then they would incur loss. Hence for safety sake, sometimes they elect to lend out money based on interbank-plus basis instead of on prime-plus.

3.2.2 Model & Methodology

Monthly high-low of the 24-hours call (= W_5, W_4) and month end figures for the interbank offer rate (= W_6) were chosen as variables to be analysed. The reason is that W_4 and W_5 illustrate the range of fluctuation during the month and reflects the short term market situation, while W_6 is the most popular rate for the medium term interbank loans.

Again, data from Feb 81 to Dec 85 were taken and analysed by the SAS program.

Model is $Y = f(W_i)$, $i = 4,5,6$. A graphical plot of Y, W_4, W_5 and W_6 against time is shown in Appendix 2.

3.2.3 Findings

a) The coefficient of determination (R^2) between Y and W_i's are shown in Table 3.5.

Table 3.5 R^2 between Y and W_i's ($i = 4,5,6$)

Variable	Short Description	Correlation with Y	Line of Regression
W_4	Interbank low	0.7197	$Y = 7.191 + 0.613\ W_4$
W_5	Interbank high	0.6772	$Y = 5.779 + 0.540\ W_5$
W_6	HIBOR 3 month	0.9200	$Y = 2.456 + 0.886\ W_6$

The Student's t-value of the coefficients for the Regression Lines are high, being at least 5.8.

b) The cross correlation among the Wi's in terms of Pearson Correlation Coefficients are shown in Table 3.6.

Table 3.6 R^2 among Wi's (i = 4,5,6)

	W4	W5	W6
W4	1.0000	0.6543	0.3950
W5	--	1.0000	0.7862
W6	--	--	1.0000

c) The volatility was measured in the same way as in Section 2.1.3 for deposit rates. Please refer to Table 3.7.

Table 3.7 Volatility Measures of Y and Wi's (i = 4,5,6)

Variable	Mean	Standard deviation	Coe. of variation	Range
Y	12.7542	3.4829	0.27	14.00
W4	8.2712	4.3927	0.53	15.50
W5	12.9195	5.3085	0.41	28.00
W6	11.6198	3.7705	0.32	13.06

From the above tables, it can be inferred that:

i) The interbank rates (W_i's) are highly volatile, the coefficient of variation can be as high as 0.53 for W_4

ii) Among the various W_i's the interbank 3 months rate (i.e. W_6) gives the least variation and is closest to Y. The standard deviation and coe. of variation of W_6 are slightly higher than Y.

iii) The spread between Y and W_6 is only 1.14 percentage point. Hence banks relying heavily on interbank loans get much lower profit margin than those having strong customer deposit base (4.75 percentage points per Section 3.1.2). Should the bank elect to use interbank 24 hour call, then there may be risk for loss since the average of W_5 is a little bit higher than Y.

In the overall sense, Y and W_6 have very high correlation. Maybe W_6 itself is already a sufficient factor to determine the Hong Kong Prime Rate.

3.3 H.K. Prime Rate Versus Foreign Interest Rates

3.3.1 Foreign Rates in Hong Kong

Hong Kong has a very highly efficient tele-communication network with many other places in the world. Also due to

the duty-free and unrestricted capital flow in and out of the society, any significant differential in interest rates between Hong Kong and other financial markets will cause immediate attention and usually be adjusted to a new short term equilibrium level very quickly.

For banks having international operations, they will put a lot of attention on the movement of these rates because arbitrage can offer a lot of potential earnings to them.

3.3.2. Model & Methodology

The U.S. financial market is the largest influencing source to other countries due to its large transaction volume and political dominance. In fact, they are the world's largest and leading market.

There are a number of popular interest rates, and the dominant ones chosen for analysis are:

W_7 = Prime Rates charged by major U.S. banks,
W_8 = U.S. Federal Funds Rates,
W_9 = Euro-dollar Deposit Rate, 3-months, &
W_{10} = U.S. Treasury Bills, 3-months.

Firstly the monthly average figures for Y and W_i's (also in monthly average figures) during Feb 81 to Sep 85 were

analysed by the SAS program. Subsequently, month-end figures of the Hong Kong Prime Rate were also analysed. Similar results were obtained.

The model is $Y = f(W_i's)$, $i = 7,8,9,10$. A graphical plot of Y, W_7, W_8, W_9 & W_{10} against time is shown in Appendix 3.

3.3.3 Findings

a) The coefficient of determination (R^2) between Y and $W_i's$ are shown in Table 3.8.

Table 3.8 R^2 between Y and $W_i's$ (i = 7,8,9,10)

Variable	Short Description	Correlation with Y	Line of Regression
W_7	U.S. Prime	0.7478	$Y = 2.111 + 0.825\ W_7$
W_8	Federal Fund	0.7144	$Y = 3.595 + 0.851\ W_8$
W_9	Euro-$ 3-mon	0.7438	$Y = 3.133 + 0.852\ W_9$
W_{10}	U.S. Bill 3m	0.7239	$Y = 2.219 + 1.080\ W_{10}$

The Student's t-value of the coefficients for the Regression Line are quite high, being at least 2.3.

From the table above, there is high correlation between Y and $W_i's$, W_7 being the highest.

b) Their cross correlation, Pearson Correlation Coefficients are shown in Table 3.9.

Table 3.9 R^2 Among W_i's (i = 7,8,9,10)

	W_7	W_8	W_9	W_{10}
W_7	1.0000	0.9714	0.9835	0.9500
W_8	--	1.0000	0.9870	0.9768
W_9	--	--	1.0000	0.9802
W_{10}	--	--	--	1.0000

c) The volatility was measured in the same way as in Section 2.1.3 for deposit rates. Please refer to Table 3.10.

Table 3.10 Volatility Measures of Y and W_i's (i = 7,8,9,10)

Variable	Mean	Standard deviation	Coe. of variation	Range
Y	13.1566	3.2157	0.24	13.60
W_7	13.3813	3.3689	0.25	11.00
W_8	11.2316	3.1925	0.28	11.57
W_9	11.7614	3.2542	0.28	11.46
W_{10}	10.1230	2.5322	0.25	9.35

From the above, it is observed that:

i) The foreign rates have quite a high correlation with the Hong Kong Prime, the R^2 value being 0.71 to 0.74. This substantiates the research findings made by the Hang Seng Bank. Please refer to the Hang Seng Monthly Jun 1985 on Capital Flows and Interest Rate Movement.

ii) The standard deviation for Y, W_7, W_8, and W_9 are very close to one each other. The corresponding figure for W_{10} is the lowest, probably because the Government Treasury Bills have to present an image of giving more stable interest rates. However in terms of the coefficient of variation, all variables give approximately the same magnitude of figures.

iii) The range of Y is larger than any of the Wi's. This indicates that the Hong Kong rate is actually NOT always following the foreign rates. sometimes they are higher and sometimes lower. Obviously there should be some local factors involved here.

3.3.4 Correlation Before and After Pegging

One may expect that after the pegging of HK$ to US$ in Oct 83, the Hong Kong interest rates should follow a more

closer pattern to the foreign rates. In order to prove this, the analysis in Section 3.3.2 was repeated with two stages of data : Feb 81 to Oct 83 (before pegging), and Nov 83 to Sep 85 (after pegging). Month-end figures were employed this time.

According to theory (Section 2.4) for interest rates in a fully open economy, Equation (4) asserts:

$$i_t = i_t^* + \dot{e}_t$$

where i_t is the Hong Kong interest rate

i_t^* is the foreign interest rate, and

$\dot{e}_t$ is the expected change of exchange rate.

Since the 'expected' change of exchange rate is a highly subjective measure, hence actual percent change of exchange rate is used instead. Let W_{11} be the percent change, then Y is analysed against the foreign rate and W_{11} together in a package.

It is clearly seen from Table 3.11 that except for W_{10} alone, all variables got higher R^2 value for 'After' than 'Before'. This substantiates the hypothesis made earlier in this section that after the pegging of HK$ to the US$, the Hong Kong prime rate follows a closer pattern to the foreign rates.

Table 3.11 R^2 for Foreign Factors Before & After Pegging

Variable	** Coefficient of Determination ** Before Pegging	After Pegging
W_7	0.7073	0.7763
W_8	0.7092	0.7170
W_9	0.7100	0.7573
W_{10}	0.7417	0.7235
W_7, W_{11}	0.7300	0.8593
W_8, W_{11}	0.7230	0.8488
W_9, W_{11}	0.7303	0.8608
W_{10}, W_{11}	0.7528	0.8448

CHAPTER 4

Verification of Theories with Hong Kong Data

The theories of 'open' and 'closed' economy as mentioned in Chapter 2 had been verified with other countries' data (e.g. Singapore, Columbia) by some scholars. It is intended to use Hong Kong data to do our own verification to see whether these theories apply or not. Detailed data are shown in Appendix 4.

4.1 For a Closed Economy

4.1.1 Model & Methodology

Per Section 2.3, the Fisher's equation is:

$$i_t = rr_t + \pi^e_t \qquad \ldots (1)$$

the finally reduced form equation is

$$i_t = \gamma_0 + \gamma_1 \log GNP_t + \gamma_2 \log M_{t-1} + \gamma_3 \pi^e_t + w_t \qquad \ldots (3)$$

Since the interest rate, i_t , is a sensitive measure, the profile of Hong Kong Prime Rate, i.e. Y, is not appropriate to be used. Hence the HIBOR 3 month (i.e. W_6) is used in the analysis.

Further let : $Z_1 = \log GDP_t$

$Z_2 = \log M_{t-1}$

$Z_3 = \pi_t$

where GDP = Hong Kong Gross Domestic Products (HK has no GNP, hence GDP is adopted)

M = money supply, M1

π = percent change of CPI(B) index

Hence the model is $W_6 = f(Z_1, Z_2, Z_3)$. Then historical data from Feb 81 to Sep 85 are used to locate their inter-relationship.

4.1.2 Findings

The coe of determination (R^2) of the regression analysis is 0.6836. The Adjusted coe. of determination (R_a^2) is 0.6717.[1]

The regression line is :

$$W_6 = \underset{(0.95)}{74.088} + \underset{(1.41)}{32.901}\ Z_1 - \underset{(-4.85)}{52.341}\ Z_2 + \underset{(1.40)}{0.538}\ Z_3$$

Judging from the above results it is obvious that this model is not applicable to Hong Kong since R^2 is not high, only 0.6836.

This exhibits that Hong Kong is not a fully closed economy. Other factors may have greater effects on the Hong Kong interest rates rather than those included in Fisher's model.

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[1] Formula is $R_a^2 = 1 - (1 - R^2)\left(\frac{n-1}{n-p}\right)$

4.2 For a Fully Open Economy

4.2.1 Model & Methodology

Per Section 2.4, the hypothetical equation for a fully open economy is :

$$i_t = i_t^* + \dot{e}_t \quad \ldots\ldots (4)$$

If we also consider the time lagging effect, then

$$i_t = \theta (i_t^* + \dot{e}_t) + (1 - \theta) i_{t-1} \quad \ldots (5)$$

Hence, if we let

$i_t = W_6$ = Hong Kong Interbank 3 months offer rate

$Z_4 = (i_t^* + \dot{e}_t)$

$Z_5 = i_{t-1}$

where $i_t^* = W_{10}$ = U.S. Treasury Bills, 3 months, int. rate

$\dot{e}_t$ = percent of change of the exchange rate

i_{t-1} = last period Hong Kong Interbank 3 month rate

Models are :

i) $W_6 = f(Z_4)$, and

ii) $W_6 = f(Z_4, Z_5)$

respectively. The former is a simple model; while the latter one takes into account of the response lagging effect.

Again historical data of Feb 81 to Sep 85 were employed.

4.2.2 Findings

The coefficients of determination (R^2) of the regression analysis are as follows:

Case i) : $W_6 = f(Z_4)$

$R^2 = 0.5344$, the line of regression is:

$$W_6 = \underset{(3.85)}{4.0592} + \underset{(7.87)}{0.7786}\ Z_4$$

Case ii) : $W_6 = f(Z_4, Z_5)$

$R^2 = 0.7958$, $R_a^2 = 0.7920$;

the line of regression is:

$$W_6 = \underset{(0.76)}{0.6221} + \underset{(3.06)}{0.2753}\ Z_4 + \underset{(8.24)}{0.7030}\ Z_5$$

From the above results, it is observed that Hong Kong is also not a fully open and free economy because R^2 is merely 0.5344. However if the effect of response lag is also considered (i.e. the latter case),then such model can give much better results. The R^2 value is 0.7958 ($R_a^2 = 0.7920$); while the response lagging factor, θ , is 0.2753. In other words under this model, Hong Kong interest rate changes 0.2753 point with respect to change of 1 point in the foreign and exchange rate factor combined. This result appears to be not too satisfactory since Hong Kong is very fast responsive to changes.

On the other hand, it is also observed that when the 2 coefficients of Z_4 & Z_5 are added, the sum is 0.9783. This is very close to the hypothetical sum of unity. $(= \theta + (1-\theta))$

4.3 For a General Case

4.3.1 Model & Methodology

It was shown that the models set in Section 4.1 & 4.2 could not explain the Hong Kong case very well due to their extreme nature. Per Section 2.5, Equation 7 gives :

$$i_t = \delta_0 + \delta_1 \log GDP_t + \delta_2 \log M_{t-1} + \delta_3 \pi_t^e + \delta_4 (i_t^* + \dot{e}_t) + \delta_5 i_{t-1} + \epsilon_t \quad \ldots (7)$$

Hence the model this time is : $W_6 = f(Z_1, Z_2, Z_3, Z_4, Z_5)$

where $Z_1 = \log GDP_t$

$Z_2 = \log M_{t-1}$

$Z_3 = \pi_t$

$Z_4 = i_t^* + e_t$

$Z_5 = i_{t-1}$

The same set of data from Feb 81 to Sep 85 were analysed.

4.3.2 Findings

The coefficient of determination (R^2) is 0.8326 (R_a^2 = 0.8159) and the line of regression is:

$$W_6 = \underset{(1.26)}{73.107} + \underset{(0.07)}{1.275}\, Z_1 - \underset{(-1.58)}{16.924}\, Z_2 + \underset{(0.64)}{0.194}\, Z_3 + \underset{(3.65)}{0.310}\, Z_4 + \underset{(2.88)}{0.382}\, Z_5$$

$$\psi = \delta_4 + \delta_5$$

$$= 0.310 + 0.382 = 0.692$$

$$\theta = \delta_4 / \psi = 0.310 / 0.692 = 0.448$$

Under this general model the results obtained are not too satisfactory because the value of R^2 is still not very high. The degree of 'openness' measured is only 0.692, and the reponse lag is 0.448. Such figures are considered to be quite below our expectation.

4.3.3 Stepwise Model

As reflected from the results obtained in Section 4.3.2, the t-values for δ_1 and δ_4 are quite low. Hence Z_1 and Z_3 may have the chance of not significantly differ from zero. Hence a stepwise procedure is also conducted to explore some more findings there.

After performing a stepwise analysis, then it is found that only Z_2, Z_4, and Z_5 are significantly chosen in the model.

The coefficient of determination (R^2) then becomes 0.8311 ($\bar{R}^2$ = 0.8247), and the line of regression is :

$$W_6 = 76.180 - 16.138\ Z_2 + 0.304\ Z_4 + 0.404\ Z_5$$
$$(-3.30) \qquad (3.65) \qquad (3.37)$$

$$\psi = \delta_4 + \delta_5$$
$$= 0.304 + 0.404 = 0.708$$

$$\theta = \delta_4 / \psi = 0.304 / 0.708 = 0.429$$

These figures are also quite similar to the results obtained in Section 4.3.2.

4.3.4 Conclusions

As the above models are only designed for general cases and Hong Kong may has her own characteristics. Hence Chapter 5 is intended to get a better representation of the Hong Kong prime rate by some more relevent factors.

CHAPTER 5

Influencing Factors Affecting H.K. Prime Rate

In this Chapter, some factors which the authors considered to have some influences with the Hong Kong Prime Rates are chosen and analysed against Y. It is expected to be able to formulate a regression model having appropriate variables chosen in order to explain the variation of Y better than those included in Chapter 4.

5.1 Model

Firstly a no. of variables which are good indicators or proxy measures in their related sectors are considered. They are thought of being quite likely to have some relationship with the Hong Kong Prime Rate under study. The rationale employed was to include both domestic and foreign factors (which should not be led by Y) in the model. Domestic factors include mainly economic and financial ones. For example, GDP, living index, exchange rate fluctuation, sale and purchase agreements of real properties are economic factors which are considered. The money supply, loans and advances to banks and customers are examples of financial factors being selected. Other indicators, e.g. Hang Seng Index of Share Prices, and Gold

Price are also included because they also have some sort of close relationship with Y.

While for the foreign factor, the 3 month U.S. Government bills' interest rate is chosen. There is no particular reason for choosing this W_{10} because as stated in Section 3.3.3 all the 4 foreign rates have roughly the same correlation with the Hong Kong interest rate. And that we had employed $W_{10} + W_{11}$ in Chapter 4, hence the same set of variables are selected again this time.

5.2 Methodology

Model is $Y = f (X_1, X_2, ... X_9)$ where :

X_1 is log(GDP),

X_2 is log M_{t-1} ,

X_3 is the percent change of living index,

X_4 is $W_{10} + W_{11}$, i.e. the sum of foreign rate and the percent change of exchange rate,

X_5 is the Hong Kong Prime Rate of the previous month,

X_6 is the Hang Seng Index of Share Price,

X_7 is Hong Kong Gold Price,

X_8 is log value of the bank loans and advances, and

X_9 is the no. of sale and purchase agreements of real properties in Hong Kong.

X_1 through X_5 are actually following the same model as the general model put forward in Chapter 4 (of course this time the dependent variable is Y, not W_6). They include GDP, money supply, inflation, world interest rate, exchange rate and response lag factor respectively.

X_6 is the Hang Seng Index for Stock Price. It is a dominant financial indicator of the investment climate in Hong Kong. Unreasonable rise of Hang Seng Index will lead to inflation, and in turn, interest rate increase. The converse also holds. Also if more people are investing in the Stock Exchange market, then more money capital will be flowing outside of the bank sector, and hence the banks will raise the interest rate to increase the cost of capital (or opportunity cost) so that a new equilbrium can be re-stored.

There is a close relationship among the gold price, exchange rate and the interest rate. Usually when there is a rise in interest rate then there will be a drop in the gold price. Conversely when the world gold price drops, then the Hong Kong gold price will also drop (especially after the pegging of HK$ to US$), and hence will create a thrust to push up domestic interest rates.

The loans and advances to customers are also related to the interest rate level. This is the demand side of the money game which just opposites that direction of money supply. When there is a general increase in money demand then the interest rate will be pull up.

The activities of real properties market in Hong Kong also have influence on the interest rate, especially during the climax period where speculation is very high. In Hong Kong, most of the sales and purchases of real properties would involve mortgage loans which in turn is very much related to the interest rate level.

Some other potential factors e.g. interbank liabilities, export values, exchange index, bank deposits amount etc, have also been considered. However due to our limitation of not putting too many variables into a model, thus those which can be better represented by other factors are not included in the final list.

Again data from Feb 81 to Sep 85 are used for analysis.

Firstly the correlation between Y and the individual X_i's are analysed. Both the cases of (i) all data, (ii) before pegging (of HK$ to US$), and (iii) after pegging are

examined. It is expected to have significant difference in the results for the 3 cases.

The equation of our regression model is :

$$Y = \delta_0 + \delta_1 X_1 + \delta_2 X_2 + \delta_3 X_3 + \delta_4 X_4 + \delta_5 X_5 + \delta_6 X_6 + \delta_7 X_7 + \delta_8 X_8 + \delta_9 X_9 \quad \ldots\ldots (8)$$

Treating the variables in a similar way as for the general model in Section 4.3, we can have :

$$Y = f \text{ (local factors, foreign factor, response lag)}$$

here

foreign factor is X_4, which is $W_{10} + W_{11}$,

response lagging factor is X_5, which is Y_{t-1},

local factors are all the remaining X_i's.

Then we still have :

$$\psi = \delta_4 + \delta_5$$
$$\theta = \delta_4 / \psi$$

Finally a stepwise process is carried out to see which variables are significantly selected.

5.3 Findings & Analysis

5.3.1 Coefficient of Determination

The R^2 values of Y Vs X_i's are shown in Table 5.1 :

Table 5.1 R^2 values Between Y and X_i's(i = 1 thru 9)

X_i	short description	All Data	Before Pegging	After Pegging
X_1	log $(GDP)_t$	0.5242	0.4474	0.2426
X_2	log M_{t-1}	0.7053	0.6433	0.7122
X_3	π_t	0.1092	0.0735	0.0126
X_4	$i_t^* + e_t$	0.5297	0.5688	0.7396
X_5	Y_{t-1}	0.8438	0.7981	0.7640
X_6	HSINDEX	0.0041	0.5719	0.8271
X_7	GOLDPRX	0.0575	0.2089	0.1855
X_8	LOGLOAN	0.6073	0.5722	0.4340
X_9	PROPERTY	0.2878	0.0083	0.4261
X_1 to X_9		0.9239	0.9008	0.9411

According to the correlation between Y and the individual X_i's, the variable having the highest R^2 is X_5. This means that Y is quite stable, and it will tend to remain unchanged over time. The foreign factor, X_4, has only R^2 of 0.5297 (0.5688 before peg and 0.7396 after peg). This

indicates that the Hong Kong Prime Rate is quite inert, and is not too responsive to foreign interest rate changes.

The values of R^2 for domestic factors vary quite a lot. X_3 and X_7 have always a low correlation with Y. It is a bit strange for X_6 where the overall correlation is low, but those before and after pegging are quite high. X_9 does not have high R^2 before pegging, but changes abruptly after that.

The total correlation for the 9 variables is high, R^2 being 0.9239 (R_3^2 = 0.9109). Roughly the same R^2 values are obtained for both periods of before and after pegging.

5.3.2 Degree of Openness and Responsive Lags

a) All Data

The regression equation for the 9 variables is shown below:

$$Y = -268.380 + 106.785\ X_1 - 24.719\ X_2 + 0.652\ X_3 + 0.223\ X_4 + 0.304\ X_5 - 0.0027\ X_6 - 0.00007\ X_7 - 31.617\ X_8 + 0.0001\ X_9$$

Hence the degree of openness and responsive lag are

$$\psi = \delta_4 + \delta_5 = 0.223 + 0.304 = 0.527$$

$$\theta = \delta_4 / \psi = 0.223 / 0.527 = 0.423$$

b) Before Pegging

The regression equation for the 9 variables is shown below:

$$Y = -202.227 + 90.394\ X_1 - 32.619\ X_2 + 0.694\ X_3 + 0.190\ X_4 + 0.454\ X_5 - 0.003\ X_6 + 0.002\ X_7 - 21.938\ X_8 + 0.0002\ X_9$$

Hence the degree of openness and responsive lag are

$$\psi = \delta_4 + \delta_5 = 0.190 + 0.454 = 0.644$$

$$\theta = \delta_4 / \psi = 0.190 / 0.644 = 0.295$$

c) After Pegging

The regression equation for the 9 variables is shown below:

$$Y = -199.479 + 58.327\ X_1 - 11.951\ X_2 + 0.058\ X_3 + 0.220\ X_4 + 0.063\ X_5 - 0.008\ X_6 - 0.001\ X_7 - 5.631\ X_8 + 0.0002\ X_9$$

Hence the degree of openness and responsive lag are

$$\psi = \delta_4 + \delta_5 = 0.220 + 0.063 = 0.283$$

$$\theta = \delta_4 / \psi = 0.220 / 0.283 = 0.777$$

5.3.3 Stepwise Model

The stepwise process reveals the findings as shown in Table 5.2.

Table 5.2 Summary of Stepwise Regression of Y Vs X_i's

(i = 1 thru 9)

	R^2	R_a^2	Variables Selected
All data	0.9036	0.8962	X_1, X_2, X_3, X_4, X_5
Before peg	0.8884	0.8725	X_2, X_3, X_4, X_5, X_7
After peg	0.9251	0.9176	X_5, X_6, X_7

The above table illustrates that the variables in the regression formula for all data are exactly the same as the general model in Section 4.3. However other formulaes seem to fit the Hong Kong situation better if the time period is split into two : before and after pegging.

X_5 is the factor which appears in all the above 3 cases.

The line of regression for the all data case is :

$$Y = -18.252 + 25.356\ X_1 - 24.529\ X_2 + 0.617\ X_3 + 0.217\ X_4 + 0.464\ X_5$$

By similar treatment, we can find :

$$\psi = \delta_4 + \delta_5 = 0.217 + 0.464 = 0.681$$

$$\theta = \delta_4 / \psi = 0.217 / 0.681 = 0.319$$

5.3.4 Regression Model (excluding X_5)

We notice that once X_5 is included in the stepwise model its effect has already dominated over all other variables. (Please note that X_5 alone has already explained about 80% of the total variance). This time lagging factor actually distorts the whole regression model.

In order to study the effect of other factors to Y, the above regression analysis is repeated once again with X_5 being picked out.

Under this new condition, the R^2 value for all the 8 remaining variables is 0.9136 (R^2 = 0.8730 before peg, and = 0.9407 after peg). This indicates that other variables can also explain the variation of Y quite well.

The Stepwise solution is shown in Table 5.3.

Table 5.3 Summary of Stepwise Regression of Y Vs X_i's (i = 1 thru 4, 6 thru 9)

	R^2	R_a^2	Variables Selected
All data	0.9125	0.9038	X_1, X_2, X_3, X_4, X_6, X_8
Before peg	0.8135	0.8011	X_2, X_3, X_4
After peg	0.9125	0.9083	X_6, X_7

Compared the above table against that in Section 5.3.3, we can observe that :

i) for all data,

X_6 and X_8 are added into the model to substitute X_5. R^2 can be maintained at a quite satisfactory level. In fact it is a little bit better.

ii) before pegging,

only X_2, X_3 and X_4 remain in the model, while X_7 is also excluded. However the R^2 value is lowered.

iii) after pegging

the 2 variables, namely X_6 and X_7, still remain; and R^2 is still quite satisfactory.

Of course the degree of openness and response lagging factor cannot be determined this time because X_5 is not present in the model.

5.4 Inference

From the above results, it is found that there is significant difference for the regression models before and after pegging of the HK$ to US$ during Oct 1983. If all data are considered, then the general model in Section 4.3 (i.e. include X_1, X_2, X_3, X_4 and X_5) still applys well.

However if the data set is split into two periods then other models are better.

The degree of openness measured in this case is 0.527, and the response lag is 0.423. (if in the stepwise model, then γ = 0.683, θ = 0.318.) This means that Hong Kong is really not too open nor fast responding as originally expected.

Y_{t-1} can explain about 80% of Y's variance, probably due to the inert behaviour of Y along with the time span under study.

If we look at the regression model after pegging, then X_5, X_6 and X_7 (i.e. Y_{t-1}, HSINDEX & GOLDPRX) together can explain 0.9251 of the total variance. Such finding is quite beyond our initial expectation. If excluding X_5, then X_6 and X_7 together can explain 0.9125 of the total variance.

CHAPTER 6

Summary and Conclusion

After a detailed study of the Hong Kong Prime Rate (formal name is Best Lending Rate) at its various aspects, now we come to a stage to summarise and conclude what the findings we have obtained so far.

Firstly the Deposit Rate is set by the Hong Kong Association of Banks regularly (usually on a weekly basis). Of course the members of the Association have various factors to consider in setting the deposit rates. They have to follow an interest rate agreement which standardises the rates given by all licensed banks. The Hong Kong Shanghai Bank then determines her prime rate. Usually this prime rate has a very close relationship with the deposit rates. So far for most of the time, they move together in the same direction as well as in the same magnitude.

The Hong Kong Prime Rate (Y) is then studied and compared against the various rates. Firstly Y is compared to the deposit rates. It is found that there is a very high correlation among Y, W_1 (= 7 days rate), W_2 (= 3 month fixed rate) and W_3 (= savings rate); R^2 value is at least

0.97. There is no time lagging effect between them. The volatility of these are also very close. The standard deviation of Y and W_2 are the same while W_1 and W_3 are slightly samller. The average spread between prime and deposit rates is 4.75 percentage points.

Y is then correlated with the interbank rates. W_4 (= interbank low), W_5 (= interbank high), and W_6 (= interbank 3 months) are studied. The interbank loan is one of the banks' source of fund, thus this is their cost of capital if their deposit base is not big enough. It is found that the average of W_5 is beyond Y by 0.165 percentage point. In other words if the bank elects to employ interbank 24 hour call rate, then they may bear a risk of loss. On the whole, if based on W_6, i.e. 3 months interbank rate, then the spread is 1.14 percentage points. In terms of correlation, W_6 itself has accounted for 92% of Y's variance. Hence it is suspected that W_6 itself is already a sufficient factor to determine Y. However since W_6 is itself a rate to be determined, hence we did not include it as a 'factor'. Rather we can treat it as an indicator only.

Y is then correlated with the various foreign interest rates; W_7 (= US Prime Rate), W_8 (= US Federal Fund Rate), W_9 (= Eurodollar 3 months rate) & W_{10} (= US Bills 3 months

rate). These rates all have roughly the same correlation with Y, in the range of 0.71 to 0.75. And they have very high inter-correlation among them. The standard deviation of these rates are all roughly the same except for W_{10} which is bit lower (i.e. more stable). It is also found that after the pegging of HK$ to US$, the foreign rates explain Y better than before.

A review of literature and theory on interest rate is then made. There are a no. of theories in relating domestic interest rate to other factors. One school of thought is by examining the supply and demand of the loanable fund of the whole economy. In this context all the demand and supply sources are related in one way or another with the interest rate. Hence the point where the aggregate of demand meets the aggregate of supply is the equilibrium point. Should the supply or demand changes, the aggregate curve will shift, then a new equilibrium level of interest rate is located. Another school of thought states that since the interest rate is very much related to the banks, hence the supply and demand of funds should be focussed on the banking sector rather than for the whole economy.

Some scholars studied the interest rates in a closed economy and in an open economy. Under the two conditions

the factors affecting the interest rate are completely different. For a completely closed economy, money supply, GDP, inflation are the major factors affecting the level of interest rates. While for a fully open economy, the world interest rates, change of exchange rate and the response lag parameter are the major factors. They also presented a general model which is a mix of the two extremes. It consists of factors from both the completely closed and fully open economies. Data of some countries e.g. Singapore, Columbia have been analysed, and proved this general model to be quite satisfactory in explaining the domestic interest rate.

The authors tried to use the same approach to verify with Hong Kong data. However the coe. of determination obtained is not very high. Under the hypothesis of a closed economy, the values of R^2 is 0.6836 only. While under the hypothesis of a fully open economy, R^2 is 0.7958. Finally under the general model R^2 is 0.8326. the degree of openness for Hong Kong measured is only 0.692, while the response lag parameter is only 0.448. This means that the Hong Kong interbank rates is affected by 0.692 point if the foreign interest rate plus expected rate of change of exchange rate is moved by 1.0 point. And the rate of change (i.e. response rate) is not high, merely 0.448 (0 is no adjustment, 1 is instantaneous adjustment).

Finally in Chapter 5, some factors which are thought of having some influence to Y are collected. These factors in fact include all the 5 factors as suggested by the general model formulated by other scholar, plus other potential ones such as Hang Seng index, gold price, bank loans and advances, and no. of sales & purchase agreements of real properities in Hong Kong. If all the 9 factors are taken together, R^2 is really close to 1 (0.90 to 0.94). If, however, stepwise is processed, then the 3 cases: a) all data, b) before peg, c) after peg give completely different results. The 'all data' again suggests that X_1 through X_5 (i.e. same factors as in the general model) should be chosen. This again substantiates that the general model is quite applicable. However for before and after peg, variables selected are X_2, X_3, X_4, X_5 & X_7 and X_5, X_6 & X_7 respectively. As X_5, i.e. time response lag factor has a dominant effect in the model, the process is run once more without X_5 in the model. In that case other regression equations are obtained.

Table 5.1 summarises all the important regression findings in Chapter 4 and 5 to facilitate easy comparison :

Table 6.1 Summary of Regression Findings in Chapter 4 and 5

	Model	R^2	ψ	θ
a) Chapter 4				
Compl. Closed	$X_6 = f(Z_1, Z_2, Z_3)$	0.6836	-	-
Fully Open	$X_6 = f(Z_4, Z_5)$	0.5344	-	-
	$X_6 = f(Z_4, Z_5)$	0.7958	0.978	0.275
General Case	$X_6 = f(Z_1 \text{ thru } Z_5)$	0.8326	0.692	0.448
(Stepwise)	$X_6 = f(Z_2, Z_4, Z_5)$	0.8311	0.708	0.429
b) Chapter 5				
All Data	$Y = f(X_1 \text{ thru } X_9)$	0.9239	0.527	0.423
Before Peg	$Y = f(X_1 \text{ thru } X_9)$	0.9008	0.644	0.295
After Peg	$Y = f(X_1 \text{ thru } X_9)$	0.9411	0.283	0.777
(Stepwise)				
All Data	$Y = f(X_1 \text{ thru } X_5)$	0.9036	0.683	0.318
Before Peg	$Y = f(X_2 \text{ thru } X_5, X_7)$	0.8884	-	-
After Peg	$Y = f(X_5, X_6, X_7)$	0.9251	-	-
(Stepwise, but excluding X_5)				
All Data	$Y = f(X_1 \text{ thru } X_4, X_6, X_8)$	0.9125	-	-
Before Peg	$Y = f(X_2, X_3, X_4)$	0.8135	-	-
After Peg	$Y = f(X_6, X_7)$	0.9125	-	-

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Title : Capital Flows and Interest Rate Movement

3. Asian Monetary Monitor
Asian Monetary Monitor Journal, Nov - Dec 1984 issue
Title : The Interest Rate Agreement - Who Benefits ?

4. Sun Hung Kai Limited
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5. Gustav Cassel
The Rate of Interest, The Bank Rate, and The Stabilization of Prices
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Data Sources

1. Hong Kong Monthly Digest of Statistics, various issues
Statistics Department, Hong Kong Government

2. Hong Kong Gross Domestic Products Estimates 1965 - 84
Statistics Department, Hong Kong Government

3. Federal Reserve Bulletin, various issues
Board of Governors of the Federal Reserves System,
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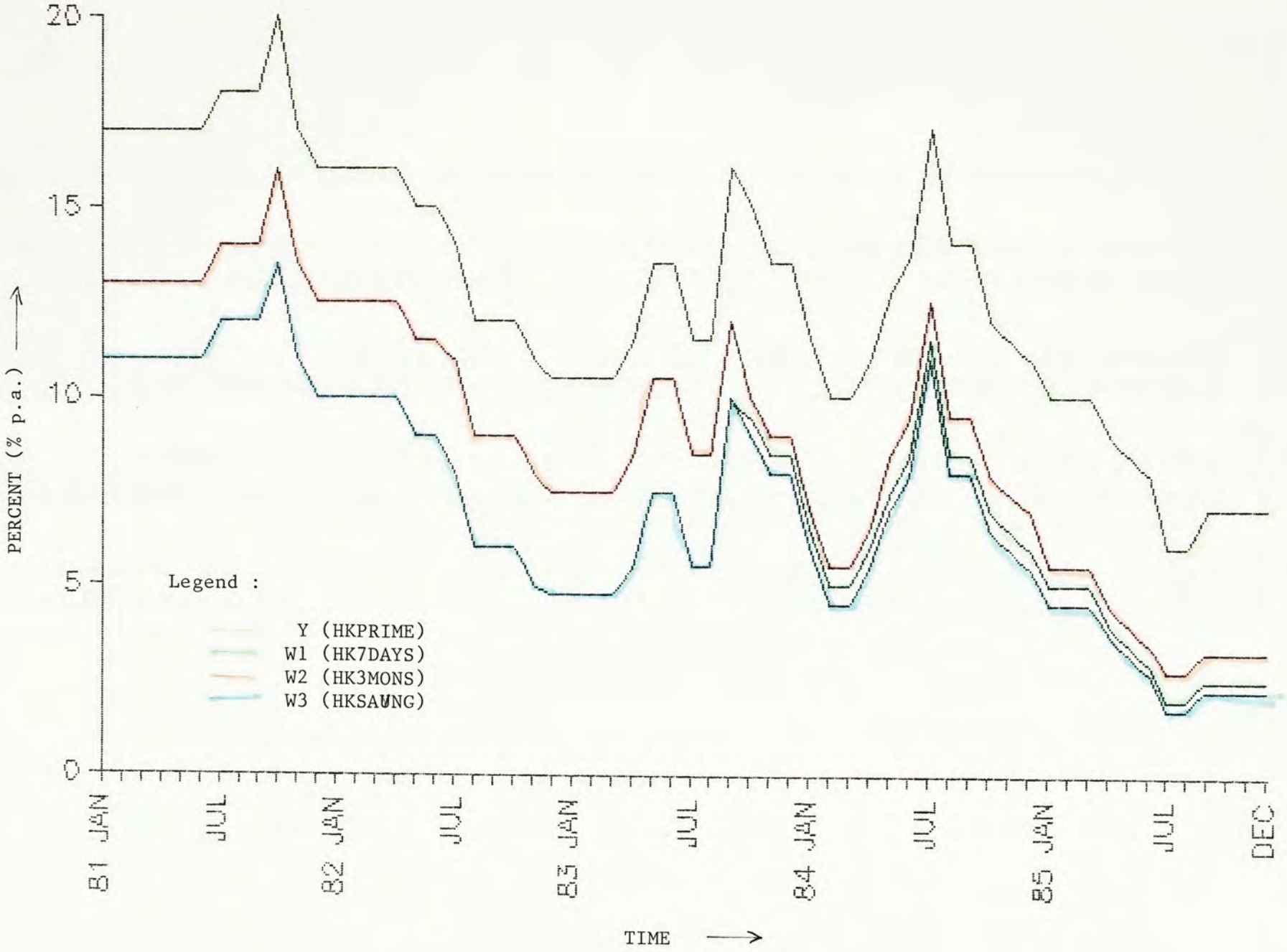
Appendix 1: a) Data Showing Profile of Y, W1, W2 and W3

YEAR	MONTH	Y HKPRIME	W1 HK7DAYS	W2 HK3MONS	W3 HKSAVNG
1981	1	17.00	11.00	13.00	11.00
	2	17.00	11.00	13.00	11.00
	3	17.00	11.00	13.00	11.00
	4	17.00	11.00	13.00	11.00
	5	17.00	11.00	13.00	11.00
	6	17.00	11.00	13.00	11.00
	7	18.00	12.00	14.00	12.00
	8	18.00	12.00	14.00	12.00
	9	18.00	12.00	14.00	12.00
	10	20.00	13.50	16.00	13.50
	11	17.00	11.00	13.50	11.00
	12	16.00	10.00	12.50	10.00
1982	1	16.00	10.00	12.50	10.00
	2	16.00	10.00	12.50	10.00
	3	16.00	10.00	12.50	10.00
	4	16.00	10.00	12.50	10.00
	5	15.00	9.00	11.50	9.00
	6	15.00	9.00	11.50	9.00
	7	14.00	8.00	11.00	8.00
	8	12.00	6.00	9.00	6.00
	9	12.00	6.00	9.00	6.00
	10	12.00	6.00	9.00	6.00
	11	11.00	5.00	8.00	5.00
	12	10.50	4.75	7.50	4.75
1983	1	10.50	4.75	7.50	4.75
	2	10.50	4.75	7.50	4.75
	3	10.50	4.75	7.50	4.75
	4	11.50	5.50	8.50	5.50
	5	13.50	7.50	10.50	7.50
	6	13.50	7.50	10.50	7.50
	7	11.50	5.50	8.50	5.50
	8	11.50	5.50	8.50	5.50
	9	16.00	10.00	12.00	10.00
	10	15.00	9.50	10.00	9.00
	11	13.50	8.50	9.00	8.00
	12	13.50	8.50	9.00	8.00
1984	1	11.50	6.50	7.00	6.00
	2	10.00	5.00	5.50	4.50
	3	10.00	5.00	5.50	4.50
	4	11.00	6.00	6.50	5.50
	5	12.75	7.50	8.50	7.00
	6	13.75	8.50	9.50	8.00
	7	17.00	11.50	12.50	11.00
	8	14.00	8.50	9.50	8.00
	9	14.00	8.50	9.50	8.00
	10	12.00	7.00	8.00	6.50
	11	11.50	6.50	7.50	6.00
	12	11.00	6.00	7.00	5.50
1985	1	10.00	5.00	5.50	4.50
	2	10.00	5.00	5.50	4.50
	3	10.00	5.00	5.50	4.50
	4	9.00	4.00	4.50	3.75
	5	8.50	3.50	4.00	3.25
	6	8.00	3.00	3.50	2.75
	7	6.00	2.00	2.75	1.75
	8	6.00	2.00	2.75	1.75
	9	7.00	2.50	3.25	2.25
	10	7.00	2.50	3.25	2.25
	11	7.00	2.50	3.25	2.25
	12	7.00	2.50	3.25	2.25

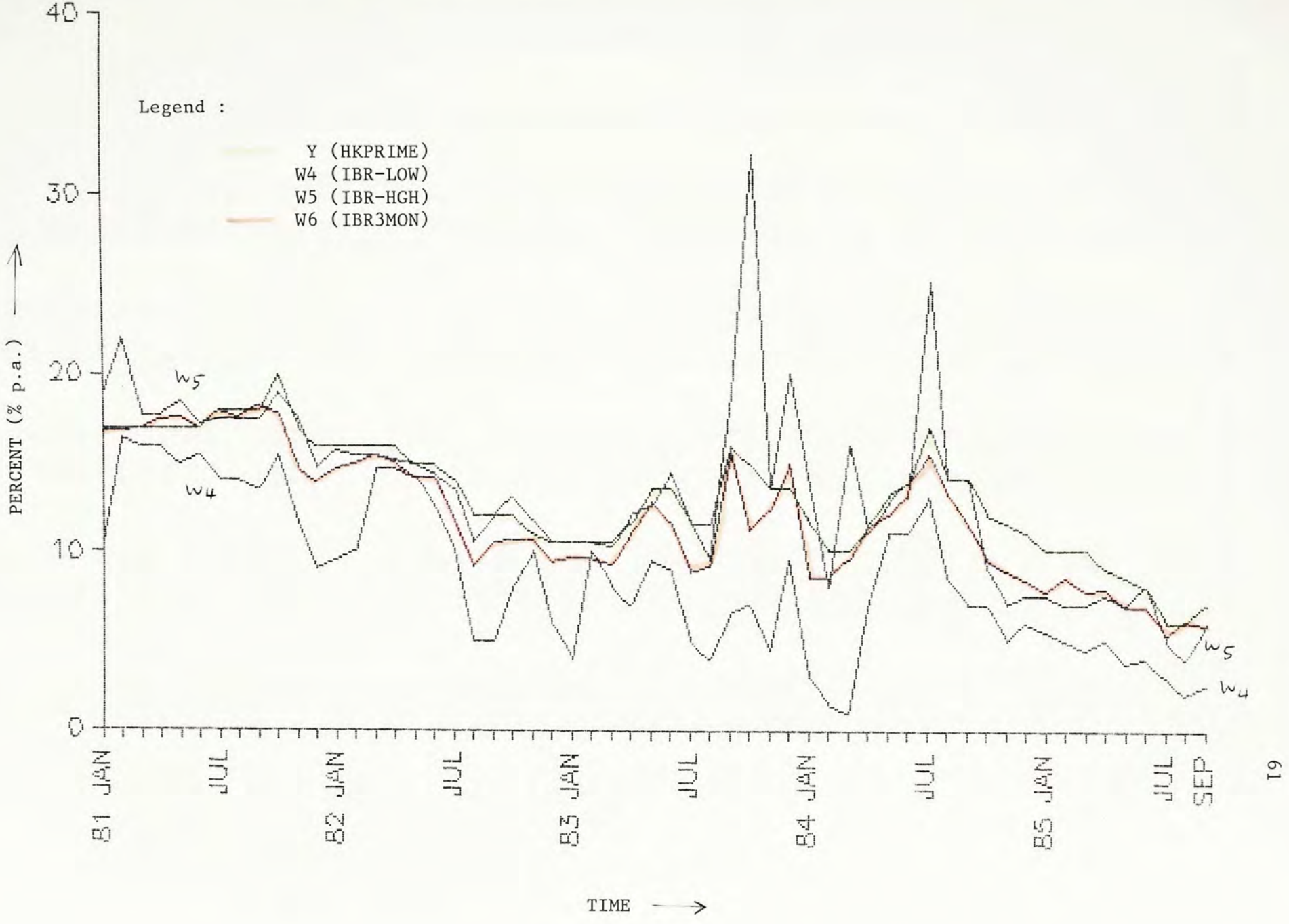
Appendix I : b) Graph Showing Profile of Y, W1, W2 & W3



Appendix 2: a) Data Showing Profile of Y, W4, W5 and W6

YEAR	MONTH	Y HKPRIME	W4 IBR-LOW	W5 IBR-HGH	W6 IBR3MON
1981	1	17.00	10.50	19.00	16.88
	2	17.00	16.50	22.00	16.88
	3	17.00	16.00	17.75	17.00
	4	17.00	16.00	17.75	17.50
	5	17.00	15.00	18.50	17.63
	6	17.00	15.50	17.25	17.00
	7	18.00	14.00	17.50	18.00
	8	18.00	14.00	17.50	17.63
	9	18.00	13.50	17.50	18.25
	10	20.00	15.50	19.00	17.88
	11	17.00	11.50	17.50	14.75
	12	16.00	9.00	14.75	13.88
1982	1	16.00	9.50	15.75	14.75
	2	16.00	10.00	15.50	14.88
	3	16.00	14.75	15.50	15.44
	4	16.00	14.75	15.25	15.06
	5	15.00	14.25	15.00	14.25
	6	15.00	12.50	14.50	14.19
	7	14.00	10.00	13.50	11.69
	8	12.00	5.00	10.50	9.13
	9	12.00	5.00	12.00	10.50
	10	12.00	8.00	13.00	10.63
	11	11.00	10.00	11.75	10.63
	12	10.50	6.00	10.50	9.38
1983	1	10.50	4.00	10.50	9.63
	2	10.50	10.00	10.50	9.69
	3	10.50	8.00	10.25	9.31
	4	11.50	7.00	12.00	11.06
	5	13.50	9.50	12.50	12.75
	6	13.50	9.00	14.50	11.69
	7	11.50	5.00	11.50	8.75
	8	11.50	4.00	9.50	9.19
	9	16.00	6.50	19.00	15.63
	10	15.00	7.00	32.00	11.13
	11	13.50	4.50	13.50	12.25
	12	13.50	9.50	20.00	14.88
1984	1	11.50	3.00	13.50	8.50
	2	10.00	1.50	8.00	8.50
	3	10.00	1.00	16.00	9.50
	4	11.00	7.00	11.25	11.50
	5	12.75	11.00	12.00	13.13
	6	13.75	11.00	13.00	13.81
	7	17.00	13.00	25.00	15.50
	8	14.00	8.50	14.00	13.13
	9	14.00	7.00	14.00	11.38
	10	12.00	7.00	9.00	9.50
	11	11.50	5.00	7.00	8.88
	12	11.00	6.00	7.50	8.38
1985	1	10.00	5.50	7.50	7.75
	2	10.00	5.00	7.00	8.50
	3	10.00	4.50	7.00	7.75
	4	9.00	5.00	7.50	7.88
	5	8.50	3.75	7.00	6.94
	6	8.00	4.00	8.00	6.94
	7	6.00	3.00	5.00	5.31
	8	6.00	2.00	4.00	6.13
	9	7.00	2.50	6.00	5.88

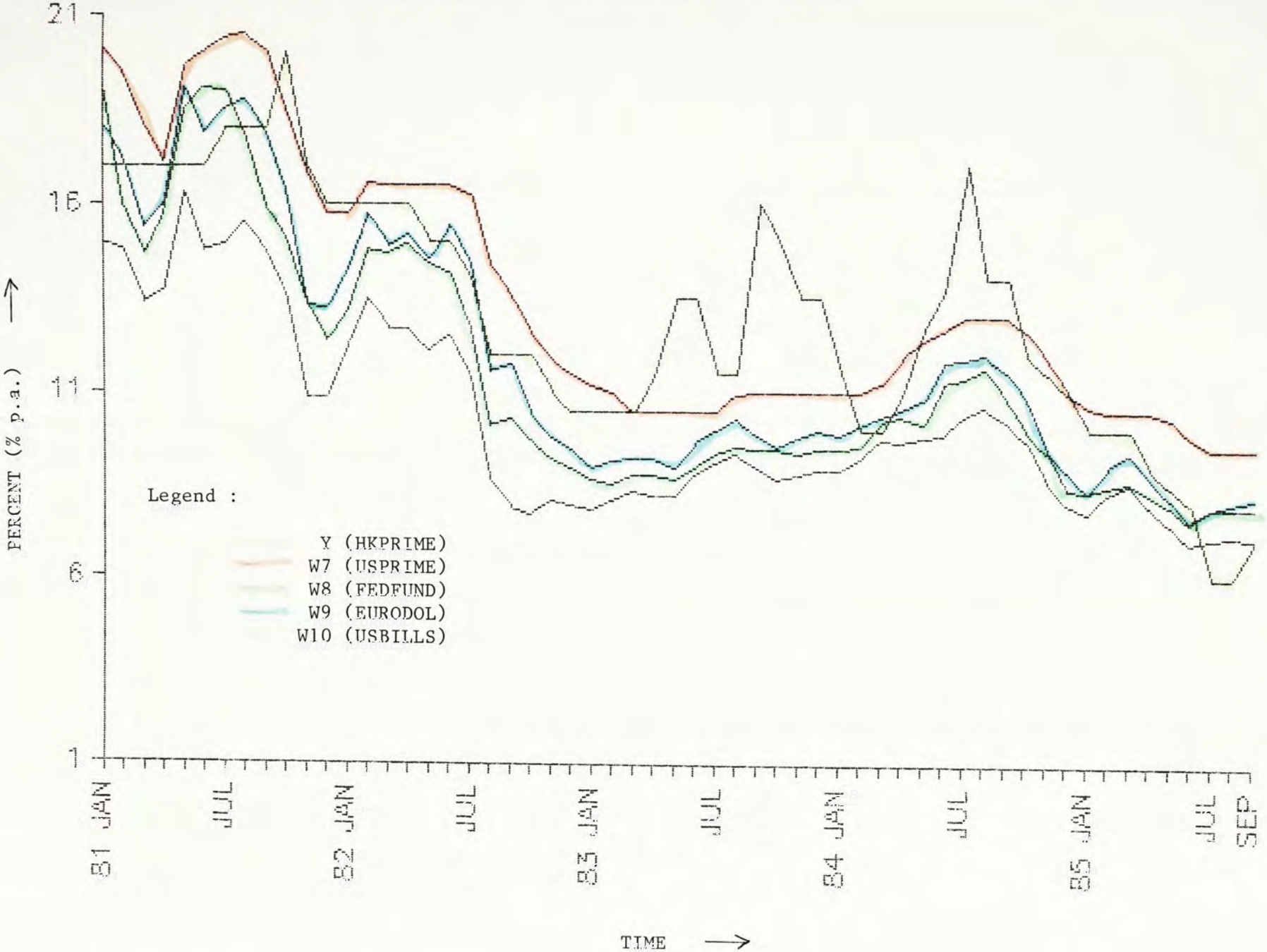
Appendix 2 : b) Graph Showing Profile of Y, W4, W5 & W6



Appendix 3: a) Data Showing Profile of Y, W7, W8, W9 and W10

YEAR	MONTH	Y HKPRIME	W7 USPRIME	W8 FEDFUND	W9 EURODOL	W10 USBILLS
1981	1	17.00	20.16	19.08	18.07	15.02
	2	17.00	19.43	15.93	17.18	14.79
	3	17.00	18.05	14.70	15.36	13.36
	4	17.00	17.15	15.72	15.95	13.69
	5	17.00	19.61	18.52	19.06	16.30
	6	17.00	20.03	19.10	17.86	14.73
	7	18.00	20.39	19.04	18.49	14.95
	8	18.00	20.50	17.82	18.79	15.51
	9	18.00	20.08	15.87	17.80	14.70
	10	20.00	18.45	15.08	16.34	13.54
	11	17.00	16.84	13.31	13.33	10.86
	12	16.00	15.75	12.37	13.24	10.85
1982	1	16.00	15.75	13.22	14.29	12.28
	2	16.00	16.56	14.78	15.75	13.48
	3	16.00	16.50	14.68	14.90	12.68
	4	16.00	16.50	14.94	15.18	12.70
	5	15.00	16.50	14.45	14.53	12.09
	6	15.00	16.50	14.15	15.45	12.47
	7	14.00	16.26	12.59	14.37	11.35
	8	12.00	14.39	10.12	11.57	8.68
	9	12.00	13.50	10.31	11.74	7.92
	10	12.00	12.52	9.71	10.43	7.71
	11	11.00	11.85	9.20	9.77	8.07
	12	10.50	11.50	8.95	9.47	7.94
1983	1	10.50	11.16	8.68	8.97	7.86
	2	10.50	10.98	8.51	9.14	8.11
	3	10.50	10.50	8.77	9.25	8.35
	4	11.50	10.50	8.80	9.23	8.21
	5	13.50	10.50	8.63	8.96	8.19
	6	13.50	10.50	8.98	9.67	8.79
	7	11.50	10.50	9.37	10.00	9.08
	8	11.50	10.89	9.56	10.27	9.34
	9	16.00	11.00	9.45	9.82	9.00
	10	15.00	11.00	9.48	9.54	8.64
	11	13.50	11.00	9.34	9.79	8.76
	12	13.50	11.00	9.47	10.00	8.90
1984	1	11.50	11.00	9.48	9.82	8.92
	2	10.00	11.00	9.52	10.12	9.21
	3	10.00	11.21	10.21	10.34	9.72
	4	11.00	11.93	10.37	10.51	9.64
	5	12.75	12.39	10.15	10.81	9.81
	6	13.75	12.60	11.20	11.78	9.84
	7	17.00	13.00	11.36	11.83	10.37
	8	14.00	13.00	11.58	11.98	10.62
	9	14.00	12.97	10.80	11.52	10.23
	10	12.00	12.58	9.99	10.77	9.74
	11	11.50	11.77	9.43	9.50	8.61
	12	11.00	11.06	8.38	8.90	8.06
1985	1	10.00	10.61	8.35	8.37	7.76
	2	10.00	10.50	8.50	9.05	8.26
	3	10.00	10.50	8.58	9.32	8.52
	4	9.00	10.50	8.27	8.74	7.95
	5	8.50	10.31	7.97	8.13	7.48
	6	8.00	9.78	7.53	7.60	6.95
	7	6.00	9.50	7.88	7.89	7.08
	8	6.00	9.50	7.90	8.03	7.14
	9	7.00	9.50	7.92	8.14	7.10

Appendix 3 : b) Graph Showing Profile of Y, W7 thru W10



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Appendix 4 Data Showing Profile of W6, Z1 thru Z5

Year	Month	W6 IBR3MONS	Z1 logGDP	Z2 $\log M_{t-1}$
1981	2	16.88	5.161	4.43
	3	17.00	5.164	4.37
	4	17.50	5.167	4.38
	5	17.63	5.170	4.37
	6	17.00	5.173	4.40
	7	18.00	5.176	4.38
	8	17.63	5.178	4.37
	9	18.25	5.179	4.38
	10	17.88	5.180	4.39
	11	14.75	5.181	4.37
	12	13.88	5.182	4.38
1982	1	14.75	5.183	4.40
	2	14.88	5.184	4.40
	3	15.44	5.185	4.41
	4	15.06	5.186	4.41
	5	14.25	5.187	4.41
	6	14.19	5.188	4.41
	7	11.69	5.189	4.42
	8	9.13	5.191	4.45
	9	10.50	5.194	4.46
	10	10.63	5.196	4.45
	11	10.63	5.198	4.44
	12	9.38	5.201	4.46
1983	1	9.63	5.203	4.47
	2	9.69	5.205	4.46
	3	9.31	5.208	4.45
	4	11.06	5.210	4.45
	5	12.75	5.212	4.45
	6	11.69	5.214	4.45
	7	8.75	5.217	4.48
	8	9.19	5.220	4.46
	9	15.63	5.220	4.47
	10	11.13	5.230	4.48
	11	12.25	5.230	4.48
	12	14.88	5.230	4.48
1984	1	8.50	5.240	4.49
	2	8.50	5.240	4.56
	3	9.50	5.240	4.52
	4	11.50	5.240	4.54
	5	13.13	5.250	4.53
	6	13.81	5.250	4.51
	7	15.50	5.260	4.52
	8	13.13	5.260	4.49
	9	11.38	5.260	4.50
	10	9.50	5.260	4.53
	11	8.88	5.260	4.53
	12	8.38	5.260	4.54
1985	1	7.75	5.260	4.57
	2	8.50	5.270	4.58
	3	0.75	5.270	4.62
	4	7.88	5.270	4.59
	5	6.94	5.270	4.59
	6	6.94	5.270	4.60
	7	5.31	5.270	4.61
	8	6.13	5.270	4.63
	9	5.88	5.270	4.64

Year	Month	Z3 π_t	Z4 $\lambda^*_{t+e_t}$	Z5 λ_{t-1}
1981	2	1.82	15.25	16.88
	3	0.89	13.93	16.88
	4	0.88	14.03	17.00
	5	0.88	17.20	17.50
	6	1.74	15.06	17.63
	7	0.85	13.51	17.00
	8	1.69	12.58	18.00
	9	0.00	11.45	17.63
	10	2.50	12.58	18.25
	11	0.00	14.98	17.88
	12	0.00	11.43	14.75
1982	1	1.63	11.01	13.88
	2	0.80	14.18	14.75
	3	0.00	14.66	14.88
	4	0.79	13.96	15.44
	5	1.57	12.43	15.06
	6	0.78	13.60	14.25
	7	0.76	11.80	14.19
	8	0.00	6.79	11.69
	9	0.76	7.69	9.13
	10	1.52	1.57	10.50
	11	0.00	6.86	10.63
	12	0.75	6.71	10.63
1983	1	0.00	5.62	9.38
	2	2.22	8.11	9.63
	3	0.72	8.35	9.69
	4	0.72	6.43	9.31
	5	0.00	5.34	11.06
	6	0.71	5.86	12.75
	7	0.71	10.86	11.69
	8	0.00	6.51	8.75
	9	2.11	16.35	9.19
	10	3.45	5.80	15.63
	11	-0.67	13.84	11.13
	12	0.27	9.27	12.25
1984	1	1.13	9.94	14.88
	2	1.12	8.92	8.50
	3	-0.26	8.12	8.50
	4	0.72	9.93	9.50
	5	0.26	9.83	11.50
	6	0.84	10.56	13.13
	7	0.13	12.52	13.81
	8	0.00	11.32	15.50
	9	0.58	12.32	13.13
	10	-0.06	11.24	11.38
	11	0.26	7.94	9.50
	12	0.26	9.95	8.88
1985	1	0.00	9.48	8.38
	2	0.64	9.82	7.75
	3	0.70	8.78	8.50
	4	0.57	5.90	7.75
	5	-0.38	7.87	7.88
	6	0.44	6.56	6.94
	7	-0.13	5.51	6.94
	8	0.13	5.81	5.31
	9	1.44	7.64	6.13

Appendix 5 Data Showing Profile of Y, X1 thru X9

Year	Month	Y HKPRIME	X1 $\log GDP_t$	X2 $\log M_{t-1}$	X3 π_e	X4 $\lambda^*_t + e_t$
1981	2	17.00	5.161	4.43	1.82	15.25
	3	17.00	5.164	4.37	0.89	13.93
	4	17.00	5.167	4.38	0.88	14.03
	5	17.00	5.170	4.37	0.88	17.20
	6	17.00	5.173	4.40	1.74	15.06
	7	18.00	5.176	4.38	0.85	13.51
	8	18.00	5.178	4.37	1.69	12.58
	9	18.00	5.179	4.38	0.00	11.45
	10	20.00	5.180	4.39	2.50	12.58
	11	17.00	5.181	4.37	0.00	14.98
	12	16.00	5.182	4.38	0.00	11.43
1982	1	16.00	5.183	4.40	1.63	11.01
	2	16.00	5.184	4.40	0.80	14.18
	3	16.00	5.185	4.41	0.00	14.66
	4	16.00	5.186	4.41	0.79	13.96
	5	15.00	5.187	4.41	1.57	12.43
	6	15.00	5.188	4.41	0.78	13.60
	7	14.00	5.189	4.42	0.76	11.80
	8	12.00	5.191	4.45	0.00	6.79
	9	12.00	5.194	4.46	0.76	7.69
	10	12.00	5.196	4.45	1.52	1.57
	11	11.00	5.198	4.44	0.00	6.86
	12	10.50	5.201	4.46	0.75	6.71
1983	1	10.50	5.203	4.47	0.00	5.62
	2	10.50	5.205	4.46	2.22	8.11
	3	10.50	5.208	4.45	0.72	8.35
	4	11.50	5.210	4.45	0.72	6.43
	5	13.50	5.212	4.45	0.00	5.34
	6	13.50	5.214	4.45	0.71	5.86
	7	11.50	5.217	4.48	0.71	10.86
	8	11.50	5.220	4.46	0.00	6.51
	9	16.00	5.220	4.47	2.11	16.35
	10	15.00	5.230	4.48	3.45	5.80
	11	13.50	5.230	4.48	-0.67	13.84
	12	13.50	5.230	4.48	0.27	9.27
1984	1	11.50	5.240	4.49	1.13	9.94
	2	10.00	5.240	4.56	1.12	8.92
	3	10.00	5.240	4.52	-0.26	8.12
	4	11.00	5.240	4.54	0.72	9.93
	5	12.75	5.250	4.53	0.26	9.83
	6	13.75	5.250	4.51	0.84	10.56
	7	17.00	5.260	4.52	0.13	12.52
	8	14.00	5.260	4.49	0.00	11.32
	9	14.00	5.260	4.50	0.58	12.32
	10	12.00	5.260	4.53	-0.06	11.24
	11	11.50	5.260	4.53	0.26	7.94
	12	11.00	5.260	4.54	0.26	9.95
1985	1	10.00	5.260	4.57	0.00	9.48
	2	10.00	5.270	4.58	0.64	9.82
	3	10.00	5.270	4.62	0.70	8.78
	4	9.00	5.270	4.59	0.57	5.90
	5	8.50	5.270	4.59	-0.38	7.87
	6	8.00	5.270	4.60	0.44	6.56
	7	6.00	5.270	4.61	-0.13	5.51
	8	6.00	5.270	4.63	0.13	5.81
	9	7.00	5.270	4.64	1.44	7.64

Appendix 5 (Continued)

Year	Month	X5 Yt-1	X6 HSINDEX	X7 GOLDPRX	X8 LOGLOAN	X9 PROPERTY
1981	2	17.00	1488	3080	5.12	2340
	3	17.00	1370	3230	5.14	2783
	4	17.00	1424	3083	5.14	3018
	5	17.00	1667	3133	5.16	2232
	6	17.00	1734	2826	5.17	2606
	7	17.00	1720	2799	5.17	1746
	8	18.00	1673	3040	5.18	1801
	9	18.00	1280	3110	5.20	1544
	10	18.00	1282	2958	5.19	1704
	11	20.00	1450	2816	5.20	1685
	12	17.00	1406	2714	5.20	1386
1982	1	16.00	1417	2667	5.22	1055
	2	16.00	1272	2542	5.23	1103
	3	16.00	1166	2236	5.24	1555
	4	16.00	1323	2476	5.25	1188
	5	16.00	1408	2217	5.26	1729
	6	15.00	1279	2213	5.27	1995
	7	15.00	1183	2440	5.28	1601
	8	14.00	1035	2959	5.28	1481
	9	12.00	927	2930	5.29	1942
	10	12.00	772	3404	5.31	1347
	11	12.00	704	3390	5.31	1264
	12	11.00	784	3492	5.32	1176
1983	1	10.50	887	3846	5.32	1420
	2	10.50	1022	3270	5.33	1093
	3	10.50	996	3313	5.34	2235
	4	10.50	1019	3542	5.34	1967
	5	11.50	919	3718	5.35	2360
	6	13.50	964	3557	5.35	2027
	7	13.50	1072	3603	5.36	2212
	8	11.50	966	3731	5.37	3742
	9	11.50	758	3900	5.39	2266
	10	16.00	865	3575	5.39	1789
	11	15.00	852	3695	5.39	1588
	12	13.50	875	3569	5.41	1748
1984	1	13.50	1102	3446	5.41	2180
	2	11.50	1059	3680	5.41	2201
	3	10.00	1014	3627	5.42	3215
	4	10.00	1037	3516	5.42	2649
	5	11.00	915	3574	5.43	3022
	6	12.75	901	3468	5.43	2281
	7	13.75	800	3202	5.44	1676
	8	17.00	927	3252	5.44	1962
	9	14.00	1003	3204	5.44	2261
	10	14.00	1015	3124	5.45	3213
	11	12.00	1128	3078	5.45	2941
	12	11.50	1200	2891	5.46	2358
1985	1	11.00	1365	2837	5.46	2786
	2	10.00	1375	2707	5.46	2185
	3	10.00	1382	3070	5.47	4865
	4	10.00	1521	3013	5.47	7857
	5	9.00	1614	2904	5.48	4072
	6	8.50	1571	2929	5.48	3976
	7	8.00	1681	3019	5.48	4483
	8	6.00	1656	3110	5.48	4118
	9	6.00	1512	3037	5.49	4637

Appendix 6 : Detailed Description of the Variables

Symbol	Short Des.	Detailed Definition
Y	HKPRIME	Prime Rate (or Best Lending Rate) quoted by the Hongkong & Shanghai Bank. Unless stated on the contrary, all figures are based on month-end closing.
(for Chapter 3)		
W_1	HK7DAYS	Time Deposits rate paid for 7 days' call as quoted by the Hongkong & Shanghai Bank. Month-end figures are used.
W_2	HK3MONS	Time Deposits rate paid for 3 months as quoted by the Hongkong & Shanghai Bank. Month-end figures are used.
W_3	HKSAVNG	Savings Deposits rate paid to depositors as quoted by the Hongkong & Shanghai Bank. Month-end figures are used.
W_4	IBR-LOW	The Interbank lending rates (24-hour call) between licensed banks in Hong Kong. The lowest figure (offer rate) during the month is taken.
W_5	IBR-HGH	The Interbank lending rates (24-hour call) between licensed banks in Hong Kong. The highest figure (offer rate) during the month is taken.
W_6	IBR3MON	The Interbank lending rates 3-month forward between licensed banks in Hong Kong. The month-end offer rate is taken. Also referred as HIBOR-3m.
W_7	USPRIME	Prime Rate charged by major banks in USA on short term business loans. The monthly average figures are taken.
W_8	FEDFUND	Interest Rate of the U.S. Federal Funds. Monthly average figures are used.

Appendix 6 (Continued)

W_9	EURODOL	Interest Rate of Euro-dollars deposit in US$, 3 months forward. Monthly average figures are used.
W_{10}	USBILLS	Interest Rate of U.S. Government Treasury Bills, 3 months forward, in the secondary market. Monthly average figures are used.
W_{11}	EX-RATE	The percent change of the effective exchange rate index for the Hong Kong Dollar calculated on trade-weighted (both import and export) basis. Monthly average figures are used.

(for Chapter 4)

Z_1	log GDP_t	Logarithm values of the Hong Kong GDP figures for the same year. GDP monthly figures are obtained by pro-rating the difference between adjacent years.
Z_2	log M_{t-1}	Logarithm values of the money supply, M1 definition, for the previous month. Monthly total in HK $ is calculated.
Z_3	$\overline{\pi}_t$	The percent change of living index between two adjacent months. Consumer Price Index (B) is taken.
Z_4	$i_t^* + e_t$	The sum of Interest Rate of U.S. Government Treasury Bills, 3 months forward (= W_{10}) and percent of change of the exchange rate (= W_{11}).
Z_5	i_{t-1}	The HK interest rate (= Y or W_6) of the previous month.

(for Chapter 5)

X_1	log GDP_t	Same as Z_1 : logaritm values of the Hong Kong GDP figures.
X_2	log M_{t-1}	Same definition as Z_2 : logarithm value of money supply, M1 definition of the previous month.

Appendix 6 (Continued)

X_3	$\bar{\pi}_t$	Same as Z_3 : the percent change of living index between two adjacent months. Consumer Price Index (B) is taken.
X_4	$i_t^* + e_t$	Same definition as Z_4 : the sum of Interest Rate of U.S. Government Treasury Bills, 3 months forward (= W_{10}) and percent change of the exchange rate (= W_{11}).
X_5	i_{t-1}	The Hong Kong Prime Rate of the previous month.
X_6	HSINDEX	Hang Seng Index of share Prices for stock transactions in the Hong Kong Stock Exchange Market. Month-end figures are used.
X_7	GOLDPRX	The month end closing price for 99% pure gold in HK$/tael. Figures quoted from the Chinese Gold and Silver Exchange Society.
X_8	LOGLOAN	Logarithm value of the loans and advances from banks to customers including both HK$ and foreign currencies. Month end figures are used.
X_9	PROPERTY	The agreement to future sale and purchase of a real property. This property may be a building under construction or a complete building. Information source from the Land Office.

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	693.30559494	693.30559494	3853.26	0.0001	0.985423	3.3258
ERROR	57	10.25584574	0.17992712		ROOT MSE		Y MEAN
CORRECTED TOTAL	58	703.56144068			0.42417817		12.75423729

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W1	1	693.30559494	3853.26	0.0001	1	693.30559494	3853.26	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	4.51394939	31.39	0.0001	0.14378985
W1	1.13738032	62.07	0.0001	0.01832279

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	683.71566559	683.71566558	1963.73	0.0001	0.971792	4.6264
ERROR	57	19.84577509	0.34817149		ROOT MSE		Y MEAN
CORRECTED TOTAL	58	703.56144068			0.59006058		12.75423729

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W2	1	683.71566558	1963.73	0.0001	1	683.71566558	1963.73	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	3.94103779	18.49	0.0001	0.21320110
W2	0.98480828	44.31	0.0001	0.02222340

Appendix 7 : Computer Print-out for Table 3.1 in Section 3.1.3a on Page 18

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	698.68821177	698.68821177	8172.25	0.0001	0.993073	2.2925
ERROR	57	4.87322891	0.08549524		ROOT MSE		Y MEAN
CORRECTED TOTAL	58	703.56144068			0.29239570		12.75423729

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W3	1	698.68821177	8172.25	0.0001	1	698.68821177	8172.25	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	4.88527525	51.42	0.0001	0.09500529
W3	1.11536039	90.40	0.0001	0.01233799

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VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
Y	59	12.75423729	3.48286802	752.50000000	6.00000000	20.00000000
W1	59	7.24576271	3.03803346	427.50000000	2.00000000	13.50000000
W2	59	8.94915254	3.48635076	528.00000000	2.75000000	16.00000000
W3	59	7.05508475	3.11180587	416.25000000	1.75000000	13.50000000
Z4	59	78.38813559	7.52494896	4624.90000000	64.90000000	90.00000000
W6	59	11.61983051	3.77066933	685.57000000	5.19000000	18.25000000
W4	59	8.27118644	4.39270755	488.00000000	1.00000000	16.50000000
W5	59	12.91949153	5.30846767	762.25000000	4.00000000	32.00000000

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 59

	Y	W1	W2	W3	Z4	W6	W4	W5
Y	1.00000 0.0000	0.99268 0.0001	0.98580 0.0001	0.99653 0.0001	0.50349 0.0001	0.95987 0.0001	0.84837 0.0001	0.82292 0.0001
W1	0.99268 0.0001	1.00000 0.0000	0.96391 0.0001	0.99762 0.0001	0.45618 0.0003	0.95823 0.0001	0.83889 0.0001	0.82590 0.0001
W2	0.98580 0.0001	0.96391 0.0001	1.00000 0.0000	0.97744 0.0001	0.57222 0.0001	0.94630 0.0001	0.85527 0.0001	0.78535 0.0001
W3	0.99653 0.0001	0.99762 0.0001	0.97744 0.0001	1.00000 0.0000	0.49771 0.0001	0.96476 0.0001	0.85304 0.0001	0.82032 0.0001
Z4	0.50349 0.0001	0.45618 0.0003	0.57222 0.0001	0.49771 0.0001	1.00000 0.0000	0.50652 0.0001	0.64249 0.0001	0.19605 0.1367
W6	0.95987 0.0001	0.95823 0.0001	0.94630 0.0001	0.96476 0.0001	0.50652 0.0001	1.00000 0.0000	0.89499 0.0001	0.78619 0.0001
W4	0.84837 0.0001	0.83889 0.0001	0.85527 0.0001	0.85304 0.0001	0.64249 0.0001	0.89499 0.0001	1.00000 0.0000	0.65425 0.0001
W5	0.82292 0.0001	0.82590 0.0001	0.78535 0.0001	0.82032 0.0001	0.19605 0.1367	0.78619 0.0001	0.65425 0.0001	1.00000 0.0000

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VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
Y	59	12.75423729	3.48286802	752.50000000	6.00000000	20.00000000
W1	59	12.24576271	3.63978345	722.50000000	2.00000000	18.50000000
W2	59	8.94915254	3.46635878	528.00000000	2.75000000	16.00000000
W3	59	7.05508475	3.11700587	416.25000000	1.75000000	13.50000000
Z4	59	78.30813559	7.52494896	4624.90000000	64.00000000	90.00000000
W6	59	11.61983051	3.77046927	685.57000000	5.19000000	18.25000000
W4	59	8.27118644	4.39270755	488.00000000	1.00000000	16.50000000
W5	59	12.91949153	5.30846767	762.25000000	4.00000000	32.00000000

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 59

	Y	W1	W2	W3	Z4	W6	W4	W5
Y	1.00000 0.0000	0.99268 0.0001	0.98580 0.0001	0.99653 0.0001	0.50349 0.0001	0.95987 0.0001	0.84837 0.0001	0.82292 0.0001
W1	0.99268 0.0001	1.00000 0.0000	0.96391 0.0001	0.99762 0.0001	0.45618 0.0003	0.95823 0.0001	0.83889 0.0001	0.82590 0.0001
W2	0.98580 0.0001	0.96391 0.0001	1.00000 0.0000	0.97744 0.0001	0.57222 0.0001	0.94630 0.0001	0.85527 0.0001	0.78535 0.0001
W3	0.99653 0.0001	0.99762 0.0001	0.97744 0.0001	1.00000 0.0000	0.49771 0.0001	0.96476 0.0001	0.85304 0.0001	0.82032 0.0001
Z4	0.50349 0.0001	0.45618 0.0003	0.57222 0.0001	0.49771 0.0001	1.00000 0.0000	0.50652 0.0001	0.64249 0.0001	0.19605 0.1367
W6	0.95987 0.0001	0.95823 0.0001	0.94630 0.0001	0.96476 0.0001	0.50652 0.0001	1.00000 0.0000	0.89499 0.0001	0.78619 0.0001
W4	0.84837 0.0001	0.83889 0.0001	0.85527 0.0001	0.85304 0.0001	0.64249 0.0001	0.89499 0.0001	1.00000 0.0000	0.65425 0.0001
W5	0.82292 0.0001	0.82590 0.0001	0.78535 0.0001	0.82032 0.0001	0.19605 0.1367	0.78619 0.0001	0.65425 0.0001	1.00000 0.0000

Appendix 7 : Computer Print-out for Table 3.4 in Section 3.1.3d on Page 20

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	506.37815014	506.37815014	146.38	0.0001	0.719736	14.5829
ERROR	57	197.18329053	3.45935597		ROOT MSE		Y MEAN
CORRECTED TOTAL	58	703.56144068			1.85993440		12.75423729

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W4	1	506.37815014	146.38	0.0001	1	506.37815014	146.38	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	7.19059753	13.84	0.0001	0.51970959
W4	0.67726317	12.10	0.0001	0.05598700

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Appendix 7 : Computer Print-out for Table 3.5 in Section 3.2.3a on Page 22

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	476.45443566	476.45443566	119.58	0.0001	0.677204	15.6503
ERROR	57	227.10700501	3.98433342		ROOT MSE		Y MEAN
CORRECTED TOTAL	58	703.56144068			1.99607951		12.75423729

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W5	1	476.45443566	119.58	0.0001	1	476.45443566	119.58	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	5.77877597	8.39	0.0001	0.68878446
W5	0.53991764	10.94	0.0001	0.04937359

Appendix 7 : Computer Print-out for Table 3.5 in Section 3.2.3a on Page 22

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	648.23271527	648.23271627	667.81	0.0001	0.921359	7.7247
ERROR	57	55.32972441	0.97067939		ROOT MSE		Y MEAN
CORRECTED TOTAL	58	703.56144068			0.98523963		12.75423729

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W6	1	648.23271627	667.81	0.0001	1	648.23271627	667.81	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	2.45139859	5.85	0.0001	0.41880963
W6	0.88365998	25.84	0.0001	0.03431070

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Appendix 7 : Computer Print-out for Table 3.5 in Section 3.2.3a on Page 22 Page 3 of 3

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
Y	59	12.75423729	3.48286802	752.50000000	6.00000000	20.00000000
W1	59	7.24576271	3.03978362	427.50000000	2.00000000	13.50000000
W2	59	8.94915254	3.48635875	528.00000000	2.75000000	16.00000000
W3	59	7.05508475	3.11380583	416.25000000	1.75000000	13.50000000
Z4	59	70.30813559	7.52494896	4624.90000000	64.90000000	90.00000000
W6	59	11.61949301	3.22946007	685.55000000	5.10000000	18.25000000
W4	59	8.27118644	4.39270795	488.00000000	1.00000000	16.50000000
W5	59	12.91949153	5.30846767	762.25000000	4.00000000	32.00000000

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 59

	Y	W1	W2	W3	Z4	W6	W4	W5
Y	1.00000 0.0000	0.99268 0.0001	0.98580 0.0001	0.99653 0.0001	0.50349 0.0001	0.95987 0.0001	0.84837 0.0001	0.82292 0.0001
W1	0.99268 0.0001	1.00000 0.0000	0.96391 0.0001	0.99762 0.0001	0.45618 0.0003	0.95823 0.0001	0.83889 0.0001	0.82590 0.0001
W2	0.98580 0.0001	0.96391 0.0001	1.00000 0.0000	0.97744 0.0001	0.57222 0.0001	0.94630 0.0001	0.85527 0.0001	0.78535 0.0001
W3	0.99653 0.0001	0.99762 0.0001	0.97744 0.0001	1.00000 0.0000	0.49771 0.0001	0.96476 0.0001	0.85304 0.0001	0.82032 0.0001
Z4	0.50349 0.0001	0.45618 0.0003	0.57222 0.0001	0.49771 0.0001	1.00000 0.0000	0.50652 0.0001	0.64249 0.0001	0.19605 0.1367
W6	0.95987 0.0001	0.95823 0.0001	0.94630 0.0001	0.96476 0.0001	0.50652 0.0001	1.00000 0.0000	0.89499 0.0001	0.78619 0.0001
W4	0.84837 0.0001	0.83889 0.0001	0.85527 0.0001	0.85304 0.0001	0.64249 0.0001	0.89499 0.0001	1.00000 0.0000	0.65425 0.0001
W5	0.82292 0.0001	0.82590 0.0001	0.78535 0.0001	0.82032 0.0001	0.19605 0.1367	0.78619 0.0001	0.65425 0.0001	1.00000 0.0000

Appendix 7 : Computer Print-out for Table 3.6 in Section 3.2.3b on Page 23 Page 1 of 1

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VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
Y	59	12.75423729	3.48286802	752.50000000	6.00000000	20.00000000
W1	59	7.24576271	3.03978346	427.50000000	2.00000000	13.50000000
W3	59	8.94915254	3.48635878	528.00000000	2.75000000	16.00000000
W2	59	7.05508475	3.11180587	416.25000000	1.75000000	13.50000000
Z4	59	78.38813559	7.52494896	4624.90000000	64.00000000	90.00000000
W6	59	11.61983051	3.77046027	685.57000000	5.12000000	18.25000000
W4	59	8.27118644	4.39270755	488.00000000	1.00000000	16.50000000
W5	59	12.91949153	5.30846767	762.25000000	4.00000000	32.00000000

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 59

	Y	W1	W2	W3	Z4	W6	W4	W5
Y	1.00000 0.0000	0.99268 0.0001	0.98580 0.0001	0.99653 0.0001	0.50349 0.0001	0.95987 0.0001	0.84837 0.0001	0.82292 0.0001
W1	0.99268 0.0001	1.00000 0.0000	0.96391 0.0001	0.99762 0.0001	0.45618 0.0003	0.95823 0.0001	0.83889 0.0001	0.82590 0.0001
W2	0.98580 0.0001	0.96391 0.0001	1.00000 0.0000	0.97744 0.0001	0.57222 0.0001	0.94630 0.0001	0.85527 0.0001	0.78535 0.0001
W3	0.99653 0.0001	0.99762 0.0001	0.97744 0.0001	1.00000 0.0000	0.49771 0.0001	0.96476 0.0001	0.85304 0.0001	0.82032 0.0001
Z4	0.50349 0.0001	0.45618 0.0003	0.57222 0.0001	0.49771 0.0001	1.00000 0.0000	0.50652 0.0001	0.64249 0.0001	0.19605 0.1367
W6	0.95987 0.0001	0.95823 0.0001	0.94630 0.0001	0.96476 0.0001	0.50652 0.0001	1.00000 0.0000	0.89499 0.0001	0.78619 0.0001
W4	0.84837 0.0001	0.83889 0.0001	0.85527 0.0001	0.85304 0.0001	0.64249 0.0001	0.89499 0.0001	1.00000 0.0000	0.65425 0.0001
W5	0.82292 0.0001	0.82590 0.0001	0.78535 0.0001	0.82032 0.0001	0.19605 0.1367	0.78619 0.0001	0.65425 0.0001	1.00000 0.0000

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y1

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	425.32551486	425.32551486	160.15	0.0001	0.747838	12.3867
ERROR	54	143.41474050	2.65582853		ROOT MSE		Y1 MEAN
CORRECTED TOTAL	55	568.74025536			1.62967129		13.15660714

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W7	1	425.32551486	160.15	0.0001	1	425.32551486	160.15	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	2.11094313	2.35	0.0226	0.89959038
W7	0.82545831	12.65	0.0001	0.06522806

Appendix 7 : Computer Print-out for Table 3.8 in Section 3.3.3a on Page 26 Page 1 of 4

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y1

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	406.29713575	406.29713575	135.06	0.0001	0.714381	13.1829
ERROR	54	162.44311960	3.00820592		ROOT MSE		Y1 MEAN
CORRECTED TOTAL	55	568.74025536			1.73441803		13.15660714

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W8	1	406.29713575	135.06	0.0001	1	406.29713575	135.06	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	3.59451714	4.21	0.0001	0.85480291
W8	0.85135545	11.62	0.0001	0.07325594

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: YI

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	423.04079304	423.04079304	156.79	0.0001	0.743621	12.4850
ERROR	54	145.69946232	2.69813819		ROOT MSE		YI MEAN
CORRECTED TOTAL	55	568.74025536			1.64260104		13.15660714

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
M9	1	423.04079304	156.79	0.0001	1	423.04079304	156.79	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	3.13307646	3.77	0.0004	0.83004961
M9	0.85223752	12.52	0.0001	0.06806152

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y1

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	411.70941241	411.70941241	141.58	0.0001	0.723897	12.9614
ERROR	54	157.03084294	2.90797857		ROOT MSE		Y1 MEAN
CORRECTED TOTAL	55	568.74025536			1.70527962		13.15660714

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W10	1	411.70941241	141.58	0.0001	1	411.70941241	141.58	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	2.21897602	2.34	0.0228	0.94705290
W10	1.08086948	11.90	0.0001	0.09080562

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Appendix 7 : Computer Print-out for Table 3.8 in Section 3.3.3a on Page 26

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
Y1	56	13.15560714	3.21570084	736.71000000	6.00000000	19.00000000
Z1	56	7.54174571	2.75251139	422.34000000	2.00000000	12.66000000
Z2	56	9.37142857	3.25336284	524.80000000	2.75000000	15.61000000
Z3	56	7.39232143	2.80567476	413.97000000	1.75000000	12.66000000
Z4	56	78.75535714	7.54980842	4410.30000000	64.00000000	90.00000000
W7	56	13.28125000	3.36886982	743.75000000	8.50000000	20.50000000
W8	56	11.23160714	3.19249049	628.97000000	7.53000000	19.10000000
W9	56	11.76142857	3.25423664	659.04000000	7.60000000	19.06000000
W10	56	10.12303571	2.83222067	566.89000000	6.89000000	16.30000000
W11	56	-0.02517857	3.14538486	-1.41000000	-6.14000000	7.35000000
Y	56	13.06250000	3.29987947	731.50000000	6.00000000	20.00000000

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 56

	Y1	Z1	Z2	Z3	Z4	W7	W8	W9	W10	W11	Y
Y1	1.00000 0.0000	0.98526 0.0001	0.98121 0.0001	0.98834 0.0001	0.52545 0.0001	0.86478 0.0001	0.84521 0.0001	0.86245 0.0001	0.85092 0.0001	0.13631 0.3165	0.97579 0.0001
Z1	0.98526 0.0001	1.00000 0.0000	0.94709 0.0001	0.99592 0.0001	0.47284 0.0002	0.85452 0.0001	0.85253 0.0001	0.86715 0.0001	0.86811 0.0001	0.14383 0.2903	0.96334 0.0001
Z2	0.98121 0.0001	0.94709 0.0001	1.00000 0.0000	0.96026 0.0001	0.57866 0.0001	0.84911 0.0001	0.82071 0.0001	0.84334 0.0001	0.81469 0.0001	0.08145 0.5507	0.96007 0.0001
Z3	0.98834 0.0001	0.99592 0.0001	0.96026 0.0001	1.00000 0.0000	0.50033 0.0001	0.87579 0.0001	0.86938 0.0001	0.88399 0.0001	0.88167 0.0001	0.11725 0.3894	0.97009 0.0001
Z4	0.52545 0.0001	0.47284 0.0002	0.57866 0.0001	0.50033 0.0001	1.00000 0.0000	0.76360 0.0001	0.68950 0.0001	0.71104 0.0001	0.61835 0.0001	-0.10148 0.4568	0.46757 0.0003
W7	0.86478 0.0001	0.85452 0.0001	0.84911 0.0001	0.87579 0.0001	0.76360 0.0001	1.00000 0.0000	0.97137 0.0001	0.98351 0.0001	0.95001 0.0001	0.09006 0.5096	0.84032 0.0001
W8	0.84521 0.0001	0.85253 0.0001	0.82071 0.0001	0.86938 0.0001	0.68950 0.0001	0.97137 0.0001	1.00000 0.0000	0.98703 0.0001	0.97679 0.0001	0.03506 0.7976	0.83647 0.0001
W9	0.86245 0.0001	0.86715 0.0001	0.84334 0.0001	0.88399 0.0001	0.71104 0.0001	0.98351 0.0001	0.98703 0.0001	1.00000 0.0000	0.98020 0.0001	0.01249 0.9272	0.85179 0.0001
W10	0.85092 0.0001	0.86811 0.0001	0.81469 0.0001	0.88167 0.0001	0.61835 0.0001	0.95001 0.0001	0.97679 0.0001	0.98020 0.0001	1.00000 0.0000	0.06076 0.6564	0.84687 0.0001
W11	0.13631 0.3165	0.14383 0.2903	0.08145 0.5507	0.11725 0.3894	-0.10148 0.4568	0.09006 0.5096	0.03506 0.7976	0.01249 0.9272	0.06076 0.6564	1.00000 0.0000	0.15694 0.2481
Y	0.97579 0.0001	0.96334 0.0001	0.96007 0.0001	0.97009 0.0001	0.46757 0.0003	0.84032 0.0001	0.83647 0.0001	0.85179 0.0001	0.84687 0.0001	0.15694 0.2481	1.00000 0.0000

Appendix 7 : Computer Print-out for Table 3.9 in Section 3.3.3b on Page 27

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VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
Y1	56	13.15560714	3.21570084	736.77000000	6.00000000	19.00000000
Z1	56	7.54178571	2.75261139	422.34000000	2.00000000	12.48000000
Z2	56	9.37142857	3.25336284	524.80000000	2.75000000	15.61000000
Z3	56	7.39232143	2.80567476	413.97000000	1.75000000	12.48000000
Z4	56	78.75535714	7.54980842	4410.30000000	64.90000000	90.00000000
W7	56	13.38125000	3.36846382	749.35000000	9.50000000	20.50000000
W8	56	11.23160714	3.19249049	628.97000000	7.53000000	19.10000000
W9	56	11.76142857	3.25423664	658.64000000	7.60000000	19.06000000
W10	56	10.12303571	2.53222067	566.89000000	6.95000000	16.30000000
W11	56	-0.02517857	2.14538486	-1.41000000	-6.14000000	7.35000000
Y	56	13.06250000	3.29987947	731.50000000	6.00000000	20.00000000

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 56

	Y1	Z1	Z2	Z3	Z4	W7	W8	W9	W10	W11	Y
Y1	1.00000 0.0000	0.98526 0.0001	0.98121 0.0001	0.98834 0.0001	0.52545 0.0001	0.86478 0.0001	0.84521 0.0001	0.86245 0.0001	0.85082 0.0001	0.13631 0.3165	0.97579 0.0001
Z1	0.98526 0.0001	1.00000 0.0000	0.94709 0.0001	0.99592 0.0001	0.47284 0.0002	0.85952 0.0001	0.85253 0.0001	0.86715 0.0001	0.86811 0.0001	0.14383 0.2903	0.96334 0.0001
Z2	0.98121 0.0001	0.94709 0.0001	1.00000 0.0000	0.96026 0.0001	0.57866 0.0001	0.84911 0.0001	0.82071 0.0001	0.84334 0.0001	0.81469 0.0001	0.08145 0.5597	0.96007 0.0001
Z3	0.98834 0.0001	0.99592 0.0001	0.96026 0.0001	1.00000 0.0000	0.50033 0.0001	0.87579 0.0001	0.86938 0.0001	0.88399 0.0001	0.88167 0.0001	0.11725 0.3894	0.97009 0.0001
Z4	0.52545 0.0001	0.47284 0.0002	0.57866 0.0001	0.50033 0.0001	1.00000 0.0000	0.75360 0.0001	0.68950 0.0001	0.71104 0.0001	0.61835 0.0001	-0.10148 0.4568	0.46757 0.0003
W7	0.86478 0.0001	0.85952 0.0001	0.84911 0.0001	0.87579 0.0001	0.75360 0.0001	1.00000 0.0000	0.97137 0.0001	0.98351 0.0001	0.95001 0.0001	-0.00006 0.9996	0.84082 0.0001
W8	0.84521 0.0001	0.85253 0.0001	0.82071 0.0001	0.86938 0.0001	0.68950 0.0001	0.97137 0.0001	1.00000 0.0000	0.98703 0.0001	0.97679 0.0001	0.03506 0.7975	0.83647 0.0001
W9	0.86245 0.0001	0.86715 0.0001	0.84334 0.0001	0.88399 0.0001	0.71104 0.0001	0.98351 0.0001	0.98703 0.0001	1.00000 0.0000	0.98020 0.0001	0.01249 0.9272	0.85179 0.0001
W10	0.85082 0.0001	0.86811 0.0001	0.81469 0.0001	0.88167 0.0001	0.61835 0.0001	0.95001 0.0001	0.97679 0.0001	0.98020 0.0001	1.00000 0.0000	0.06076 0.6564	0.84887 0.0001
W11	0.13631 0.3165	0.14383 0.2903	0.08145 0.5507	0.11725 0.3894	-0.10148 0.4568	-0.00006 0.9996	0.03506 0.7976	0.01249 0.9272	0.06076 0.6564	1.00000 0.0000	0.15694 0.2481
Y	0.97579 0.0001	0.96334 0.0001	0.96007 0.0001	0.97009 0.0001	0.46757 0.0003	0.84082 0.0001	0.83647 0.0001	0.85179 0.0001	0.84887 0.0001	0.15694 0.2481	1.00000 0.0000

Appendix 7 : Computer Print-out for Table 3.10 in Section 3.3.3c on Page 27 Page 1 of 1

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	171.67533156	171.67533156	74.90	0.0001	0.707277	10.3759
ERROR	31	71.05194116	2.29199810		ROOT MSE		Y MEAN
CORRECTED TOTAL	32	242.72727273			1.51393464		14.59090909

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W7	1	171.67533156	74.90	0.0001	1	171.67533156	74.90	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	4.89794358	4.26	0.0002	1.15056823
W7	0.64995298	8.65	0.0001	0.07509917

Appendix 7 : Computer Print-out for Table 3.11 in Section 3.3.4 on Page 30

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	172.13380796	172.13380796	75.59	0.0001	0.709166	10.3423
ERROR	31	70.59346477	2.27720854		ROOT MSE		Y MEAN
CORRECTED TOTAL	32	242.72727273			1.50904226		14.59090909

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W8	1	172.13380796	75.59	0.0001	1	172.13380796	75.59	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	6.15894595	6.15	0.0001	1.00366974
W8	0.67003733	8.69	0.0001	0.07706680

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Appendix 7 : Computer Print-out for Table 3.11 in Section 3.3.4 on Page 30 Page 2 of 16

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	172.34274845	172.34274845	75.91	0.0001	0.710026	10.3270
ERROR	31	70.38452428	2.27046853		ROOT MSE		Y MEAN
CORRECTED TOTAL	32	242.72727273			1.50680739		14.59090909

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W9	1	172.34274845	75.91	0.0001	1	172.34274845	75.91	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	5.64094687	5.32	0.0001	1.06022412
W9	0.67787182	8.71	0.0001	0.07780523

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	180.02109781	180.02109731	89.00	0.0001	0.741660	9.7475
ERROR	31	62.70617492	2.02277984			ROOT MSE	Y MEAN
CORRECTED TOTAL	32	242.72727273				1.42224465	14.59090909

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W10	1	180.02109731	89.00	0.0001	1	180.02109731	89.00	0.0001

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	5.12456974	4.96	0.0001	1.03353923
W10	0.85309966	9.43	0.0001	0.09042943

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	177.18792488	88.59396244	40.55	0.0001	0.729988	10.1300
ERROR	30	65.53934785	2.18464493		ROOT MSE		Y MEAN
CORRECTED TOTAL	32	242.72727273			1.47805444		14.59090909

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W7	1	171.67533156	78.58	0.0001	1	161.52129101	73.93	0.0001
W11	1	5.51259331	2.52	0.1227	1	5.51259331	2.52	0.1227

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	5.18749895	4.56	0.0001	1.13799351
W7	0.62536486	8.60	0.0001	0.07389222
W11	0.17304650	1.59	0.1227	0.10893695

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	175.50177788	87.75088894	39.16	0.0001	0.723041	10.2594
ERROR	30	67.22549485	2.24084983		ROOT MSE		Y MEAN
CORRECTED TOTAL	32	242.72727273			1.49694684		14.59090909

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W8	1	172.13330796	76.82	0.0001	1	159.83514401	71.32	0.0001
W11	1	3.36796992	1.50	0.2297	1	3.36796992	1.50	0.2297

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	6.42102620	6.32	0.0001	1.01663561
W8	0.65540552	8.45	0.0001	0.07749439
W11	0.13604627	1.23	0.2297	0.11097085

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	177.26133344	88.63066672	40.62	0.0001	0.730290	10.1243
ERROR	30	65.46593929	2.18219798		ROOT MSE		Y MEAN
CORRECTED TOTAL	32	242.72727273			1.47722545		14.59090909

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W9	1	172.34274845	78.98	0.0001	1	161.50466058	74.05	0.0001
W11	1	4.91858499	2.25	0.1437	1	4.91858499	2.25	0.1437

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	5.91363424	5.60	0.0001	1.05516060
W9	0.66237633	8.61	0.0001	0.07697295
W11	0.16366831	1.50	0.1437	0.10901634

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	182.73364276	91.36682138	45.62	0.0001	0.752835	9.6019
ERROR	30	59.99362997	1.99978767		ROOT MSE		Y MEAN
CORRECTED TOTAL	32	242.72727273			1.41413849		14.72727273

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W10	1	180.02109781	90.02	0.0001	1	167.06700830	83.54	0.0001
W11	1	2.71254496	1.36	0.2533	1	2.71254496	1.36	0.2533

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	5.38093539	5.12	0.0001	1.05095915
W10	0.93440433	9.14	0.0001	0.10222283
W11	0.12231474	1.16	0.2533	0.10502248

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	130.79390764	130.79390764	72.88	0.0001	0.776300	12.3251
ERROR	21	37.68978802	1.79475181		ROOT MSE		Y MEAN
CORRECTED TOTAL	22	168.48369565			1.33960347		10.86956522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W7	1	130.79390764	72.88	0.0001	1	130.79390764	72.88	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-12.79001712	-4.59	0.0002	2.78554615
W7	2.11566577	8.54	0.0001	0.24783093

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	120.81106852	120.81106852	53.22	0.0001	0.717049	13.8616
ERROR	21	47.67262713	2.27012510		ROOT MSE		Y MEAN
CORRECTED TOTAL	22	168.48369565			1.50669343		10.86956522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
M8	1	120.81106852	53.22	0.0001	1	120.81106852	53.22	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-6.85443066	-2.80	0.0108	2.44981991
M8	1.90331517	7.30	0.0001	0.26090490

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	127.59738046	127.59738046	65.54	0.0001	0.757328	12.8371
ERROR	21	40.80631519	1.94696739		ROOT MSE		Y MEAN
CORRECTED TOTAL	22	168.40369565			1.39533773		10.86956522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W9	1	127.59738046	65.54	0.0001	1	127.59738046	65.54	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-6.35336858	-2.96	0.0075	2.14728296
W9	1.77693447	8.10	0.0001	0.21948530

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	121.90509042	121.90509042	54.96	0.0001	0.723542	13.7015
ERROR	21	46.97860523	2.21802882		ROOT MSE		Y MEAN
CORRECTED TOTAL	22	168.88369565			1.48930481		10.86956522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W10	1	121.90509042	54.96	0.0001	1	121.90509042	54.96	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-7.03401748	-2.89	0.0089	2.43485928
W10	2.05203768	7.41	0.0001	0.27679485

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	144.77526065	72.38763033	61.06	0.0001	0.859284	10.0167
ERROR	20	23.70843500	1.18542175		ROOT MSE		Y MEAN
CORRECTED TOTAL	22	168.48369565			1.08877075		10.86956522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W1	1	130.79390764	110.34	0.0001	1	88.61352731	74.76	0.0001
W11	1	13.98135302	11.79	0.0026	1	13.98135302	11.79	0.0026

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-10.20201741	-4.28	0.0004	2.38596295
W1	1.85819497	8.65	0.0001	0.21491436
W11	0.54383921	3.43	0.0026	0.15835521

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	143.01490502	71.50745251	56.15	0.0001	0.848835	10.3819
ERROR	20	25.46879063	1.27343953		ROOT MSE		Y MEAN
CORRECTED TOTAL	22	168.48369565			1.12846778		10.86956522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W8	1	120.81106552	94.87	0.0001	1	80.45817168	63.21	0.0001
W11	1	22.20383650	17.44	0.0005	1	22.20383650	17.44	0.0005

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-5.09059879	-2.70	0.0137	1.88283597
W8	1.67554483	8.26	0.0001	0.20282930
W11	0.66604914	4.18	0.0005	0.15969920

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	145.03320613	72.51660307	61.85	0.0001	0.860814	9.9621
ERROR	20	23.45048952	1.17252448		ROOT MSE		Y MEAN
CORRECTED TOTAL	22	168.48369565			1.08283169		10.86956522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W9	1	127.59738046	108.82	0.0001	1	84.87647279	75.10	0.0001
W11	1	17.43582567	14.87	0.0010	1	17.43582567	14.87	0.0010

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-4.58184336	-2.65	0.0153	1.72853307
W9	1.56096359	8.71	0.0001	0.17929176
W11	0.59912130	3.86	0.0010	0.15536545

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	142.33604743	71.16802371	54.44	0.0001	0.844806	10.9194
ERROR	20	26.14764822	1.30738241		ROOT MSE		Y MEAN
CORRECTED TOTAL	22	168.48369565			1.14349824		10.86956522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
W10	1	121.90509042	93.24	0.0001	1	86.17931409	65.92	0.0001
W11	1	20.43095700	15.63	0.0008	1	20.43095700	15.63	0.0008

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-5.18676384	-2.69	0.0140	1.92687363
W10	1.80083162	8.12	0.0001	0.22180581
W11	0.64307520	3.95	0.0008	0.16267422

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: W6

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	3	497.81368814	165.93789605	37.45	0.0001	0.683594	17.6553
ERROR	52	230.41665471	4.43108951		ROOT MSE		W6 MEAN
CORRECTED TOTAL	55	728.23034286			2.10501532		11.92285714

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
Z1	1	391.34105849	88.32	0.0001	1	8.85255020	2.00	0.1635
Z2	1	97.78205983	22.07	0.0001	1	104.18618991	23.51	0.0001
Z3	1	8.69057135	1.96	0.1673	1	8.69057135	1.96	0.1673

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	74.08787450	0.95	0.3489	78.37325486
Z1	32.90294749	1.41	0.1635	23.27713191
Z2	-52.34055291	-4.85	0.0001	10.79415101
Z3	0.53810668	1.40	0.1673	0.38423726

Appendix 7 : Computer Print-out for Regression Line in Section 4.1.2 on Page 32

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: W6

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	389.17539966	389.17539966	61.98	0.0001	0.534413	21.0164
ERROR	54	339.05494320	6.27879524		ROOT MSE		W6 MEAN
CORRECTED TOTAL	55	728.23034286			2.50575243		11.92285714

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
Z4	1	389.17539966	61.98	0.0001	1	389.17539966	61.98	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	4.05918114	3.85	0.0003	1.05346117
Z4	0.77863685	7.87	0.0001	0.09889094

Appendix 7 : Computer Print-out for Regression Line in Section 4.2.2(i) on Page 34

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: W6

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	579.51501626	289.75750813	103.27	0.0001	0.795785	14.0695
ERROR	53	148.71532660	2.80594956		ROOT MSE		W6 MEAN
CORRECTED TOTAL	55	728.23034286			1.67509688		11.90285714

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
Z4	1	389.17533966	138.70	0.0001	1	26.24343826	9.35	0.0035
Z5	1	190.33961660	67.83	0.0001	1	190.33961660	67.83	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	0.62211710	0.76	0.4506	0.81859885
Z4	0.27533470	3.06	0.0035	0.09003070
Z5	0.70301630	8.24	0.0001	0.08529701

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Appendix 7 : Computer Print-out for Regression Line in Section 4.2.2(ii) on Page 34

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: W6

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	5	606.29595513	121.25919103	49.72	0.0001	0.832561	13.0278
ERROR	50	121.93438772	2.43868775		ROOT MSE		W6 MEAN
CORRECTED TOTAL	55	728.23034286			1.56162984		11.92285714

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
Z1	1	391.34105649	160.47	0.0001	1	0.01164885	0.00	0.9453
Z2	1	97.78205831	40.10	0.0001	1	6.05826426	2.48	0.1233
Z3	1	8.69057135	3.56	0.0649	1	1.01453464	0.42	0.5219
Z4	1	88.22112656	36.18	0.0001	1	32.44928811	13.31	0.0006
Z5	1	20.26114043	8.31	0.0058	1	20.26114043	8.31	0.0058

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	73.10655832	1.26	0.2145	58.15112847
Z1	1.27501657	0.07	0.9452	16.44813408
Z2	-16.73360085	1.58	0.1213	10.58732377
Z3	0.19385975	0.64	0.5219	0.30055457
Z4	0.31047144	3.65	0.0006	0.08511325
Z5	0.39151908	2.68	0.0058	0.13246581

Appendix 7 : Computer Print-out for Regression Line in Section 4.3.2 on Page 35

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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE W6

NOTE: SLENTRY AND SLSTAY HAVE BEEN SET TO .15 FOR THE STEPWISE TECHNIQUE.

STEP 1 VARIABLE Z5 ENTERED R SQUARE = 0.75974804 C(P) = 19.74299560

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	1	553.27157801	553.27157801	170.76	0.0001
ERROR	54	174.95876485	3.23997713		
TOTAL	55	728.23034286			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	1.25545795				
Z5	0.88020032	0.06735709	553.27157801	170.76	0.0001

BOUNDS ON CONDITION NUMBER: 1, 2

STEP 2 VARIABLE Z4 ENTERED R SQUARE = 0.79578532 C(P) = 10.98170064

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	2	579.51501626	289.75750813	103.27	0.0001
ERROR	53	148.71532660	2.80594956		
TOTAL	55	728.23034286			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	0.62211710				
Z4	0.27533479	0.09003070	26.24343826	9.35	0.0035
Z5	0.70301630	0.08535731	190.33961660	67.83	0.0001

BOUNDS ON CONDITION NUMBER: 1.954287, 14.83429

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STEP 3 VARIABLE Z2 ENTERED R SQUARE = 0.83109422 C(P) = 2.43791097

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	3	605.22802700	201.74267567	85.29	0.0001
ERROR	52	123.00231586	2.36542915		
TOTAL	55	728.23034286			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	75.17996217				
Z2	-16.13788182	4.89468827	25.71301074	10.87	0.0018
Z4	0.30362926	0.08310624	31.57402169	13.35	0.0006
Z5	0.40401385	0.11986020	26.87524625	11.36	0.0014

BOUNDS ON CONDITION NUMBER: 4.337259, 56.4725

NO OTHER VARIABLES MET THE 0.1500 SIGNIFICANCE LEVEL FOR ENTRY INTO THE MODEL.

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SUMMARY OF STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE Y

STEP	VARIABLE ENTERED	VARIABLE REMOVED	NUMBER IN	PARTIAL R**2	MODEL R**2	C(P)	F	PROB>F
1	Z5		1	0.7597	0.7597	19.7430	170.7640	0.0001
2	Z4		2	0.0360	0.7958	10.9817	9.3528	0.0035
3	Z2		3	0.0353	0.8311	2.4379	10.8703	0.0018

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	313.94375916	313.94375916	59.49	0.0001	0.524195	17.5861
ERROR	54	284.96249084	5.27708316		ROOT MSE		Y MEAN
CORRECTED TOTAL	55	598.90625000			2.29719028		13.06250000

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X1	1	313.94375916	59.49	0.0001	1	313.94375916	59.49	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	360.63714360	8.00	0.0001	45.06394465
X1	-66.60523160	-7.71	0.0001	8.63533887

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	422.39066941	422.39066941	129.22	0.0001	0.705270	13.8410
ERROR	54	176.51558059	3.26880705			ROOT MSE	Y MEAN
CORRECTED TOTAL	55	598.90625000				1.80798425	13.06250000

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X2	1	422.39066941	129.22	0.0001	1	422.39066941	129.22	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	176.67828989	12.27	0.0001	14.39540449
X2	-36.56072876	-11.37	0.0001	3.21626873

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Appendix 7 : Computer Print-out for Table 5.1 in Section 5.3.1 on Page 43

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	65.40092064	65.40092064	6.62	0.0129	0.109201	24.0628
ERROR	54	533.59532936	9.87972832		ROOT MSE		Y MEAN
CORRECTED TOTAL	55	598.99625000			3.14320351		13.06250000

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X3	1	65.40092064	6.62	0.0129	1	65.40092064	6.62	0.0129

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	12.08977812	21.39	0.0001	0.56511830
X3	1.38818616	2.57	0.0129	0.53954576

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	317.23288654	317.23288654	60.82	0.0001	0.529687	17.4844
ERROR	54	281.67336346	5.21617340		ROOT MSE		Y MEAN
CORRECTED TOTAL	55	598.90625000			2.28389435		13.06250000

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X4	1	317.23288654	60.82	0.0001	1	317.23288654	60.82	0.0001

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	5.96276690	6.21	0.0001	0.96018824
X4	0.70299359	7.80	0.0001	0.09014430

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Appendix 7 : Computer Print-out for Table 5.1 in Section 5.3.1 on Page 43

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	505.36798495	505.36798495	291.75	0.0001	0.843818	10.0756
ERROR	54	93.53826505	1.73219009		ROOT MSE		Y MEAN
CORRECTED TOTAL	55	598.90625000			1.31612693		13.06250000

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
XS	1	505.36798495	291.75	0.0001	1	505.36798495	291.75	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	0.65841990	0.88	0.3821	0.74719731
XS	0.93678825	17.08	0.0001	0.05484479

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Appendix 7 : Computer Print-out for Table 5.1 in Section 5.3.1 on Page 43

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	2.47365674	2.47365674	0.22	0.6379	0.004130	25.4424
ERROR	54	596.43259326	11.04504802		ROOT MSE		Y MEAN
CORRECTED TOTAL	55	598.90625000			3.32340910		13.06250000

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X6	1	2.47365674	0.22	0.6379	1	2.47365674	0.22	0.6379

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	12.19365516	6.46	0.0001	1.88888195
X6	0.00072906	0.47	0.6379	0.00154056

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	34.44909066	34.44909066	3.30	0.0750	0.057520	24.7510
ERROR	54	564.45715934	10.45291036		ROOT MSE		Y MEAN
CORRECTED TOTAL	55	598.90625000			3.23309609		13.06250000

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X7	1	34.44909066	3.30	0.0750	1	34.44909066	3.30	0.0750

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	19.02535215	5.74	0.0001	3.31290206
X7	-0.00169984	-1.82	0.0750	0.00104652

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	363.73383294	363.73383294	83.52	0.0001	0.607330	15.9761
ERROR	54	235.17241706	4.35504476		ROOT MSE		Y MEAN
CORRECTED TOTAL	55	598.90625000			2.08687440		13.06250000

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X8	1	363.73383294	83.52	0.0001	1	363.73383294	83.52	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	136.66807926	10.10	0.0001	13.52803854
X8	-23.15485528	-9.14	0.0001	2.53364949

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	172.35553859	172.35553859	21.82	0.0001	0.287784	21.5160
ERROR	54	426.55071141	7.89908725		ROOT MSE		Y MEAN
CORRECTED TOTAL	55	598.90625000			2.81053149		13.06250000

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X9	1	172.35553859	21.82	0.0001	1	172.35553859	21.82	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	16.59074083	10.67	0.0001	0.84354698
X9	-0.00147817	-4.67	0.0001	0.00031645

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	9	553.33394169	61.48154908	62.06	0.0001	0.923907	7.6198
ERROR	46	45.57230831	0.99070235		ROOT MSE		Y MEAN
CORRECTED TOTAL	55	598.90625000			0.99534032		13.06250000

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X1	1	313.94375916	316.89	0.0001	1	10.95277847	11.06	0.0017
X2	1	127.50673070	128.70	0.0001	1	8.65415883	8.74	0.0049
X3	1	18.84573918	19.02	0.0001	1	12.15036876	12.26	0.0010
X4	1	59.11369260	59.67	0.0001	1	14.67607368	14.81	0.0004
X5	1	21.75636122	21.96	0.0001	1	6.19317369	6.25	0.0160
X6	1	1.46681067	1.48	0.2299	1	7.14239245	7.21	0.0101
X7	1	0.71448350	0.72	0.4002	1	0.02654219	0.03	0.8707
X8	1	9.61932801	9.71	0.0032	1	9.33715809	9.42	0.0036
X9	1	0.36703666	0.37	0.5457	1	0.36703666	0.37	0.5457

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-268.38009690	-2.73	0.0090	98.41180127
X1	106.78483454	3.32	0.0017	32.11582071
X2	-24.71872931	-2.96	0.0049	8.36310877
X3	0.65248384	3.50	0.0010	0.18631449
X4	0.22261909	3.85	0.0004	0.05784010
X5	0.30400021	2.50	0.0160	0.12158748
X6	-0.00266247	-2.69	0.0101	0.00099160
X7	-0.0000747	-0.16	0.8707	0.00045658
X8	-31.61675454	-3.07	0.0036	10.29867917
X9	0.00011229	0.61	0.5457	0.00018449

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	108.60571869	108.60571869	25.10	0.0001	0.447439	14.2856
ERROR	31	134.12155403	4.32650174		ROOT MSE		Y MEAN
CORRECTED TOTAL	32	242.72727273			2.08002446		14.59090909

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X1	1	108.60571869	25.10	0.0001	1	108.60571869	25.10	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	555.40048258	5.15	0.0001	107.94161434
X1	-104.16452224	-5.01	0.0001	20.79035576

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	156.14340618	156.14340618	55.90	0.0001	0.643287	11.4540
ERROR	31	86.58386654	2.79303795		ROOT MSE		Y MEAN
CORRECTED TOTAL	32	242.72727273			1.67123546		14.58080909

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X2	1	156.14340618	55.90	0.0001	1	156.14340618	55.90	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	280.82175503	7.99	0.0001	35.60809043
X2	-60.19196812	-7.48	0.0001	8.05034095

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	17.84955583	17.84955583	2.46	0.1269	0.073537	18.4691
ERROR	31	224.87771690	7.25411990		ROOT MSE		Y MEAN
CORRECTED TOTAL	32	242.72727273			2.69334734		14.58090909

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X3	1	17.84955583	2.46	0.1269	1	17.84955583	2.46	0.1269

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	13.76148110	19.47	0.0001	0.70668759
X3	0.87587596	1.57	0.1269	0.55836096

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	138.06027006	138.06027006	40.89	0.0001	0.568788	12.5934
ERROR	31	104.66700267	3.37635492		ROOT MSE		Y MEAN
CORRECTED TOTAL	32	242.72727273			1.83748603		14.59090909

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X4	1	138.06027006	40.89	0.0001	1	138.06027006	40.89	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	9.02950265	9.74	0.0001	0.92666541
X4	0.52066708	6.39	0.0001	0.08142194

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	193.72392342	193.72392342	122.55	0.0001	0.793114	8.6169
ERROR	31	49.00334930	1.58075320		ROOT MSE		Y MEAN
CORRECTED TOTAL	32	242.72727273			1.25726006		14.59090909

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X5	1	193.72392342	122.55	0.0001	1	193.72392342	122.55	0.0001

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	1.64787292	1.39	0.1758	1.18947603
X5	0.88039233	11.07	0.0001	0.07979837

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	138.81177497	138.81177497	41.41	0.0001	0.571884	12.5481
ERROR	31	103.91549776	3.35211283		ROOT MSE		Y MEAN
CORRECTED TOTAL	32	242.72727273			1.83087761		14.59090909

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X6	1	138.81177497	41.41	0.0001	1	138.81177497	41.41	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	6.23078577	4.67	0.0001	1.33631373
X6	0.00702455	6.44	0.0001	0.00109160

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	50.70529402	50.70529402	8.19	0.0075	0.208998	17.0574
ERROR	31	192.02197871	6.19425738			ROOT MSE	Y MEAN
CORRECTED TOTAL	32	242.72727273				2.48882651	14.59090909

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X7	1	50.70529402	8.19	0.0075	1	50.70529402	8.19	0.0075

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	22.67764601	7.93	0.0001	2.85946211
X7	-0.09262118	-2.86	0.0075	0.03091615

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	138.88939590	138.88939590	41.46	0.0001	0.572204	12.5434
ERROR	31	103.83787682	3.34960893			ROOT MSE	Y MEAN
CORRECTED TOTAL	32	242.72727273				1.83019369	14.59090909

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X8	1	138.88939590	41.46	0.0001	1	138.88939590	41.46	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	152.16139637	7.12	0.0001	21.36663193
X8	-26.14053135	-6.44	0.0001	4.05954088

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	2.02449525	2.02449525	0.26	0.6132	0.008341	19.0975
ERROR	31	240.70277748	7.76460573		ROOT MSE		Y MEAN
CORRECTED TOTAL	32	242.72727273			2.78650421		14.59090909

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X9	1	2.02449525	0.26	0.6132	1	2.02449525	0.26	0.6132

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	13.81593629	8.67	0.0001	1.59333737
X9	0.00041657	0.51	0.6132	0.00081581

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	9	218.64306201	24.29367356	23.20	0.0001	0.900777	7.0133
ERROR	23	24.08421072	1.04713960			ROOT MSE	Y MEAN
CORRECTED TOTAL	32	242.72727273				1.02329839	14.59090909

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X1	1	108.60571869	103.72	0.0001	1	1.03013500	0.98	0.3316
X2	1	47.64623950	45.50	0.0001	1	6.33410213	6.05	0.0219
X3	1	31.31161879	29.90	0.0001	1	8.26741369	7.90	0.0099
X4	1	11.21319471	10.71	0.0033	1	7.03094992	6.71	0.0163
X5	1	14.33491865	13.69	0.0012	1	6.73495717	6.43	0.0185
X6	1	1.31471841	1.26	0.2741	1	2.35535780	2.25	0.1473
X7	1	2.93524791	2.80	0.1076	1	0.05184152	0.05	0.8259
X8	1	0.99137373	0.95	0.3407	1	0.87997610	0.84	0.3688
X9	1	0.29003161	0.28	0.6037	1	0.29003161	0.28	0.6037

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-202.22748995	-0.58	0.5682	349.28377839
X1	90.39389475	0.99	0.3316	91.13691409
X2	-32.61881655	-2.46	0.0219	13.26257829
X3	0.69390849	2.81	0.0099	0.24695604
X4	0.19024075	2.59	0.0163	0.07341737
X5	0.45376675	2.54	0.0185	0.17892356
X6	-0.00252743	-1.50	0.1473	0.00168521
X7	0.00017429	0.22	0.8259	0.00078332
X8	-21.93750485	-0.92	0.3688	23.93062720
X9	0.00019289	0.53	0.6037	0.00036652

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	40.87029903	40.87029903	6.73	0.0170	0.242577	22.6791
ERROR	21	127.61339663	6.07682841		ROOT MSE		Y MEAN
CORRECTED TOTAL	22	168.48369565			2.46512239		10.86956522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X1	1	40.87029903	6.73	0.0170	1	40.87029903	6.73	0.0170

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	534.30379746	2.65	0.0151	201.83575766
X1	-99.57805907	-2.59	0.0170	38.39708331

Appendix 7 : Computer Print-out for Table 5.1 in Section 5.3.1 on Page 43

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	120.00045956	120.00045956	51.98	0.0001	0.712238	13.9788
ERROR	21	48.48323609	2.30872553			ROOT MSE	Y MEAN
CORRECTED TOTAL	22	168.48369565				1.51944909	10.86956522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X2	1	120.00045956	51.98	0.0001	1	120.00045956	51.98	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	224.56901375	7.58	0.0001	29.64305137
X2	-46.96691176	-7.21	0.0001	6.51459422

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	2.12202111	2.12202111	0.27	0.6102	0.012595	25.8943
ERROR	21	166.36167454	7.92198450		ROOT MSE		Y MEAN
CORRECTED TOTAL	22	168.48369565			2.81460201		10.86956522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X3	1	2.12202111	0.27	0.6102	1	2.12202111	0.27	0.6102

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	11.07971580	15.53	0.0001	0.71365647
X3	-0.60493909	-0.52	0.6102	1.16883657

Appendix 7 : Computer Print-out for Table 5.1 in Section 5.3.1 on Page 43

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	124.60854073	124.60854073	59.64	0.0001	0.739588	13.4980
ERROR	21	43.87515492	2.08929309		ROOT MSE		Y MEAN
CORRECTED TOTAL	22	168.48369565			1.44543872		10.86956522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X4	1	124.60854073	59.64	0.0001	1	124.60854073	59.64	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	0.79608600	0.59	0.5584	1.33875127
X4	1.08738922	7.72	0.0001	0.14080264

Appendix 7 : Computer Print-out for Table 5.1 in Section 5.3.1 on Page 43

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	128.72559290	128.72559290	67.99	0.0001	0.764024	12.6388
ERROR	21	39.75810275	1.89324299			ROOT MSE	Y MEAN
CORRECTED TOTAL	22	168.48369565				1.37595167	10.89565522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X5	1	128.72559290	67.99	0.0001	1	128.72559290	67.99	0.0001

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	1.04431056	0.85	0.4038	1.22561053
X5	0.87589479	8.25	0.0001	0.10622401

Appendix 7 : Computer Print-out for Table 5.1 in Section 5.3.1 on Page 43

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	139.36814279	139.36814279	100.52	0.0001	0.827191	10.8328
ERROR	21	29.11555286	1.38645490		ROOT MSE		Y MEAN
CORRECTED TOTAL	22	168.48369565			1.17747819		10.86956522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X6	1	139.36814279	100.52	0.0001	1	139.36814279	100.52	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	21.27716179	19.95	0.0001	1.06669808
X6	-0.00870295	-10.03	0.0001	0.00086804

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	31.25782324	31.25782324	4.78	0.0402	0.185524	23.5178
ERROR	21	137.22587241	6.53456535		ROOT MSE		Y MEAN
CORRECTED TOTAL	22	168.48369565			2.55627959		10.86956522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X7	1	31.25782324	4.78	0.0402	1	31.25782324	4.78	0.0402

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-2.05457017	-0.35	0.7326	5.93321541
X7	0.00401957	2.19	0.0402	0.00183784

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Appendix 7 : Computer Print-out for Table 5.1 in Section 5.3.1 on Page 43

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	73.12218712	73.12218712	16.10	0.0006	0.434002	19.6049
ERROR	21	95.36150853	4.54102422		ROOT MSE		Y MEAN
CORRECTED TOTAL	22	168.48369565			2.13096791		10.86956522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X8	1	73.12218712	16.10	0.0006	1	73.12218712	16.10	0.0006

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	364.74309739	4.14	0.0005	88.18727363
X8	-64.97238956	-4.01	0.0006	16.19127921

Appendix 7 : Computer Print-out for Table 5.1 in Section 5.3.1 on Page 43

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	1	71.79067951	71.79067951	15.59	0.0007	0.426099	19.7413
ERROR	21	96.69301615	4.60442934		ROOT MSE		Y MEAN
CORRECTED TOTAL	22	168.48369565			2.14579341		10.86956522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X9	1	71.79067951	15.59	0.0007	1	71.79067951	15.59	0.0007

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	14.84122834	13.48	0.0001	1.10086078
X9	-0.00126392	-3.95	0.0007	0.00032009

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Appendix 7 : Computer Print-out for Table 5.1 in Section 5.3.1 on Page 43

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	9	158.55616583	17.61735176	23.07	0.0001	0.941077	8.0396
ERROR	13	9.92752982	0.76365614		ROOT MSE		Y MEAN
CORRECTED TOTAL	22	168.48369565			0.87387421		10.86956522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X1	1	40.87029903	53.52	0.0001	1	0.71037864	0.93	0.3524
X2	1	86.48073553	113.26	0.0001	1	0.52165651	0.68	0.4234
X3	1	2.11780920	2.77	0.1198	1	0.01564904	0.02	0.8884
X4	1	16.20811415	21.22	0.0005	1	0.89754736	1.18	0.2980
X5	1	0.36621585	0.48	0.5008	1	0.06715863	0.09	0.7715
X6	1	11.81565742	15.47	0.0017	1	10.48112762	13.72	0.0026
X7	1	0.26786781	0.35	0.5638	1	0.47762220	0.63	0.4432
X8	1	0.00813448	0.01	0.9194	1	0.01866244	0.02	0.8782
X9	1	0.41333236	0.54	0.4750	1	0.41333236	0.54	0.4750

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-199.47917529	-1.02	0.3277	196.15276682
X1	58.32684511	0.96	0.3524	60.47452458
X2	-11.99134788	-0.83	0.4234	14.46017327
X3	0.05774042	0.14	0.8884	0.40335278
X4	0.22027608	1.08	0.2980	0.20318310
X5	0.06305812	0.30	0.7715	0.21263709
X6	-0.00825553	-3.70	0.0026	0.00222838
X7	-0.00149082	-0.79	0.4432	0.00182187
X8	-5.63065000	-0.16	0.8782	36.01830362
X9	0.00017047	0.74	0.4750	0.00023172

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	9	553.33394169	61.48154908	62.06	0.0001	0.923907	7.6198
ERROR	46	45.57230831	0.99070235		ROOT MSE		Y MEAN
CORRECTED TOTAL	55	598.90625000			0.99534032		13.06250000

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X1	1	313.94375916	316.89	0.0001	1	10.95277347	11.06	0.0017
X2	1	127.50673070	128.70	0.0001	1	8.65415883	8.74	0.0049
X3	1	18.84573918	19.02	0.0001	1	12.15036876	12.26	0.0010
X4	1	59.11369260	59.67	0.0001	1	14.57607368	14.81	0.0004
X5	1	21.75636122	21.96	0.0001	1	6.19317369	6.25	0.0160
X6	1	1.46681067	1.48	0.2299	1	7.14239245	7.21	0.0101
X7	1	0.71448350	0.72	0.4002	1	0.02654219	0.03	0.8707
X8	1	9.61932801	9.71	0.0032	1	9.33715809	9.42	0.0036
X9	1	0.36703666	0.37	0.5457	1	0.36703666	0.37	0.5457

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-268.38009690	-2.73	0.0090	98.41180127
X1	106.78483454	3.32	0.0017	32.11582071
X2	-24.71872931	-2.96	0.0049	8.36310877
X3	0.65248384	3.50	0.0010	0.18631449
X4	0.22261909	3.85	0.0004	0.05784010
X5	0.30400021	2.50	0.0160	0.12158748
X6	-0.00266247	-2.69	0.0101	0.00099160
X7	-0.0000747	-0.16	0.8707	0.00045658
X8	-31.61675454	-3.07	0.0036	10.29867917
X9	0.00011229	0.61	0.5457	0.00018449

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	9	218.64306201	24.29367356	23.20	0.0001	0.900777	7.0133
ERROR	23	24.08421072	1.04713960		ROOT MSE		Y MEAN
CORRECTED TOTAL	32	242.72727273			1.02329839		14.59090909

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X1	1	108.60571869	103.72	0.0001	1	1.03013500	0.98	0.3316
X2	1	47.64623950	45.50	0.0001	1	6.33410213	6.05	0.0219
X3	1	31.31161879	29.90	0.0001	1	8.26741369	7.90	0.0099
X4	1	11.21319471	10.71	0.0033	1	7.03094992	6.71	0.0163
X5	1	14.33491865	13.69	0.0012	1	6.73495717	6.43	0.0185
X6	1	1.31471841	1.26	0.2741	1	2.35535780	2.25	0.1473
X7	1	2.93524791	2.80	0.1076	1	0.05184152	0.05	0.8259
X8	1	0.99137373	0.95	0.3407	1	0.87997610	0.84	0.3688
X9	1	0.29003161	0.28	0.6037	1	0.29003161	0.28	0.6037

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-202.22748995	-0.58	0.5682	349.28377839
X1	90.39389475	0.99	0.3316	91.13691409
X2	-32.61881655	-2.46	0.0219	13.26257829
X3	0.69390849	2.81	0.0099	0.24695604
X4	0.19024075	2.59	0.0163	0.07341737
X5	0.45376675	2.54	0.0185	0.17892356
X6	-0.00252743	-1.50	0.1473	0.00168521
X7	0.00017429	0.22	0.8259	0.00078332
X8	-21.93750485	-0.92	0.3688	23.93062720
X9	0.00019289	0.53	0.6037	0.00036652

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GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	9	158.55616583	17.61735176	23.07	0.0001	0.941077	8.0396
ERROR	13	9.92752982	0.76365614		ROOT MSE		Y MEAN
CORRECTED TOTAL	22	168.48369565			0.87387421		10.86956522

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X1	1	40.87029903	53.52	0.0001	1	0.71037864	0.93	0.3524
X2	1	86.48873553	113.26	0.0001	1	0.52165651	0.68	0.4234
X3	1	2.11780920	2.77	0.1198	1	0.01564904	0.02	0.8884
X4	1	16.20811415	21.22	0.0005	1	0.89754736	1.18	0.2980
X5	1	0.36621585	0.48	0.5008	1	0.06715863	0.09	0.7715
X6	1	11.81565742	15.47	0.0017	1	10.48112762	13.72	0.0026
X7	1	0.26786781	0.35	0.5638	1	0.47762220	0.63	0.4432
X8	1	0.00813448	0.01	0.9194	1	0.01866244	0.02	0.8782
X9	1	0.41333236	0.54	0.4750	1	0.41333236	0.54	0.4750

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-199.47917529	-1.02	0.3277	196.15276682
X1	58.32684511	0.96	0.3524	60.47452458
X2	-11.95134788	-0.83	0.4234	14.46017327
X3	0.05774042	0.14	0.8884	0.40335278
X4	0.22027608	1.08	0.2980	0.20318310
X5	0.06305812	0.30	0.7715	0.21263709
X6	-0.00825553	-3.70	0.0026	0.00222838
X7	-0.00144082	-0.79	0.4432	0.00182187
X8	-5.63065000	-0.16	0.8782	36.01830362
X9	0.00017047	0.74	0.4750	0.00023172

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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE Y

NOTE: SLENTRY AND SLSTAY HAVE BEEN SET TO .15 FOR THE STEPWISE TECHNIQUE.

STEP 1 VARIABLE X5 ENTERED R SQUARE = 0.84381819 C(P) = 42.41611258

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	1	505.36798495	505.36798495	291.75	0.0001
ERROR	54	93.53826505	1.73219009		
TOTAL	55	598.90625000			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	0.65841990				
X5	0.93678825	0.05484479	505.36798495	291.75	0.0001

BOUNDS ON CONDITION NUMBER: 1, 2

STEP 2 VARIABLE X4 ENTERED R SQUARE = 0.86052724 C(P) = 34.31503732

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	2	515.37514399	257.68757199	163.50	0.0001
ERROR	53	83.53110601	1.57605860		
TOTAL	55	598.90625000			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	0.58139834				
X4	0.17261696	0.06850373	10.00715904	6.35	0.0148
X5	0.81094598	0.07232519	198.14225745	125.72	0.0001

BOUNDS ON CONDITION NUMBER: 1.911312, 15.2905

STEP 3 VARIABLE X2 ENTERED R SQUARE = 0.88240983 C(P) = 23.08642420

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	3	528.48076216	176.16025405	130.07	0.0001
ERROR	52	70.42548784	1.35433630		
TOTAL	55	598.90625000			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	57.41739914				
X2	-12.00470508	3.85909971	13.10561817	9.68	0.0030
X4	0.20367113	0.06428246	13.59566842	10.04	0.0026
X5	0.55217335	0.10684115	36.17431687	26.71	0.0001

BOUNDS ON CONDITION NUMBER: 4.953728, 61.72246

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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE Y

STEP 4 VARIABLE X3 ENTERED R SQUARE = 0.89623157 C(P) = 16.73081199

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	4	536.75868685	134.18967171	110.12	0.0001
ERROR	51	62.14756315	1.21857967		
TOTAL	55	598.90625000			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	52.59936730				
X2	-10.98673023	3.60143745	10.84920381	8.90	0.0044
X3	0.80369477	0.18555837	8.27792470	6.79	0.0120
X4	0.20039994	0.06097922	13.82581838	11.35	0.0014
X5	0.94340303	0.10140083	34.99972831	28.72	0.0001

BOUNDS ON CONDITION NUMBER: 4.859079, 91.17972

STEP 5 VARIABLE X1 ENTERED R SQUARE = 0.90359098 C(P) = 14.28155113

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	5	541.16628285	108.23325657	93.72	0.0001
ERROR	50	57.73996715	1.15479934		
TOTAL	55	598.90625000			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	-18.28245707				
X1	25.35581477	12.97856267	4.40759600	3.82	0.0563
X2	-24.52856535	7.80410762	11.40786370	9.88	0.0028
X3	0.61711766	0.19815362	11.20052726	9.70	0.0030
X4	0.21739230	0.05367948	15.32334714	13.27	0.0006
X5	0.96365045	0.10681957	21.75636122	18.84	0.0001

BOUNDS ON CONDITION NUMBER: 16.66574, 358.121

NO OTHER VARIABLES MET THE 0.1500 SIGNIFICANCE LEVEL FOR ENTRY INTO THE MODEL.

SUMMARY OF STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE Y

STEP	VARIABLE ENTERED	VARIABLE REMOVED	NUMBER IN	PARTIAL R**2	MODEL R**2	C(P)	F	PROB>F
1	X5		1	0.6838	0.6838	42.6161	291.7509	0.0001
2	X4		2	0.0167	0.8005	34.0150	6.3695	0.0148
3	X2		3	0.0219	0.8224	23.0864	9.6768	0.0030
4	X3		4	0.0138	0.8362	16.7308	6.7931	0.0120
5	X1		5	0.0074	0.9035	14.2819	3.8169	0.0563

STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE Y

NOTE: SLENTRY AND SLSTAY HAVE BEEN SET TO .15 FOR THE STEPWISE TECHNIQUE.

STEP 1 VARIABLE X5 ENTERED R SQUARE = 0.79811354 C(P) = 17.79734152

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	1	193.72392342	193.72392342	122.55	0.0001
ERROR	31	49.00334930	1.58075320		
TOTAL	32	242.72727273			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	1.64787292				
X5	0.88339233	0.07979837	193.72392342	122.55	0.0001

BOUNDS ON CONDITION NUMBER: 1, 2

STEP 2 VARIABLE X4 ENTERED R SQUARE = 0.83326345 C(P) = 11.64958275

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	2	202.25576425	101.12788212	74.96	0.0001
ERROR	30	40.47150848	1.34905028		
TOTAL	32	242.72727273			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	2.34057608				
X4	0.17950139	0.07137737	8.53184082	6.32	0.0175
X5	0.70525035	0.10223630	64.19549419	47.59	0.0001

BOUNDS ON CONDITION NUMBER: 1.923349, 15.38679

STEP 3 VARIABLE X3 ENTERED R SQUARE = 0.85583150 C(P) = 8.41830133

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	3	207.73364616	69.24454872	57.38	0.0001
ERROR	29	34.99362657	1.20667678		
TOTAL	32	242.72727273			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	2.15137645				
X3	0.48963187	0.22980465	5.47788191	4.54	0.0417
X4	0.17577545	0.06752858	8.17583596	6.78	0.0144
X5	0.68923370	0.09698288	60.94440172	50.51	0.0001

BOUNDS ON CONDITION NUMBER: 1.934974, 29.26739

STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE Y

STEP 4 VARIABLE X2 ENTERED R SQUARE = 0.87279990 C(P) = 6.48502249

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	4	211.85233818	52.96308455	48.03	0.0001
ERROR	28	30.87938454	1.10267623		
TOTAL	32	242.72727273			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	94.65704991				
X2	-20.22372256	10.46418590	4.11869202	3.74	0.0634
X3	0.58390357	0.24158422	8.93691420	8.01	0.0085
X4	0.13953785	0.06222095	4.75139198	4.31	0.0472
X5	0.49436875	0.13696287	14.38934890	13.05	0.0012

BOUNDS ON CONDITION NUMBER: 4.279663, 94.54078

STEP 5 VARIABLE X7 ENTERED R SQUARE = 0.88842520 C(P) = 4.86307251

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	5	215.64502542	43.12900508	43.00	0.0001
ERROR	27	27.08224730	1.00304620		
TOTAL	32	242.72727273			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	104.68351123				
X2	-23.31032208	10.10618803	5.33907852	5.32	0.0289
X3	0.64443901	0.23130406	7.78606570	7.76	0.0096
X4	0.16167547	0.06513331	6.19530530	6.18	0.0194
X5	0.53404368	0.13214197	16.38299419	16.33	0.0004
X7	0.00093101	0.00047822	3.79268724	3.78	0.0633

BOUNDS ON CONDITION NUMBER: 4.388343, 137.9157

NO OTHER VARIABLES MET THE 0.1500 SIGNIFICANCE LEVEL FOR ENTRY INTO THE MODEL.

SUMMARY OF STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE Y

STEP	VARIABLE ENTERED	VARIABLE REMOVED	NUMBER IN	PARTIAL R**2	MODEL R**2	C(P)	F	PROB>F
1	X5		1	0.7981	0.7981	17.7973	122.5517	0.0001
2	X4		2	0.0351	0.8333	11.6496	6.3243	0.0175
3	X3		3	0.0226	0.8558	8.4183	4.5396	0.0417
4	X2		4	0.0170	0.8728	6.4850	3.7352	0.0634
5	X7		5	0.0156	0.8884	4.8631	3.7812	0.0623

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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE Y

NOTE: SLENTRY AND SLSTAY HAVE BEEN SET TO .15 FOR THE STEPWISE TECHNIQUE.

STEP 1 VARIABLE X6 ENTERED R SQUARE = 0.82719068 C(P) = 19.12652230

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	1	139.36814279	139.36814279	100.52	0.0001
ERROR	21	29.11555286	1.38645490		
TOTAL	22	168.48369565			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	21.27716179				
X6	-0.00870295	0.00086804	139.36814279	100.52	0.0001

BOUNDS ON CONDITION NUMBER: 1, 2

STEP 2 VARIABLE X7 ENTERED R SQUARE = 0.91234613 C(P) = 2.29474580

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	2	153.74914455	76.87457227	104.35	0.0001
ERROR	20	14.73455110	0.73672756		
TOTAL	22	168.48369565			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	36.88886883				
X6	-0.01146072	0.00088882	122.49132131	166.26	0.0001
X7	-0.00982974	0.00225282	14.38100176	19.52	0.0003

BOUNDS ON CONDITION NUMBER: 1.973099, 15.78479

Appendix 7 : Computer Print-out for Table 5.2 in Section 5.3.3 on Page 46

STEP 3 VARIABLE X5 ENTERED R SQUARE = 0.92513099 C(P) = 1.51817817

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	3	155.86948747	51.95649582	78.26	0.0001
ERROR	19	12.61420818	0.66390569		
TOTAL	22	168.48369565			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	29.56644766				
X5	0.21605815	0.12089847	2.12034292	3.19	0.0899
X6	-0.00926670	0.00148968	25.69025574	38.70	0.0001
X7	-0.00312217	0.00091316	7.76112440	11.69	0.0029

BOUNDS ON CONDITION NUMBER: 6.150518, 73.64648

NO OTHER VARIABLES MET THE 0.1500 SIGNIFICANCE LEVEL FOR ENTRY INTO THE MODEL.

SAS 21:02 WEDNESDAY, MAY 7, 1986 6

SUMMARY OF STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE Y

STEP	VARIABLE ENTERED	VARIABLE REMOVED	NUMBER IN	PARTIAL R**2	MODEL R**2	C(P)	F	PROB>F
1	X6		1	0.8272	0.8272	19.1265	100.5212	0.0001
2	X7		2	0.0854	0.9125	2.2947	19.5201	0.0003
3	X5		3	0.0126	0.9251	1.5182	3.1937	0.0899

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: Y

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	8	547.14076800	68.39259600	62.10	0.0001	0.913567	8.0242
ERROR	47	51.76548200	1.10139323		ROOT MSE		Y MEAN
CORRECTED TOTAL	55	598.90625000			1.04947284		13.06250000

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
X1	1	313.94375916	285.04	0.0001	1	40.99543086	37.22	0.0001
X2	1	127.50673070	115.77	0.0001	1	35.71660878	31.93	0.0001
X3	1	18.84573918	17.11	0.0001	1	15.99086871	14.52	0.0004
X4	1	59.11369260	53.67	0.0001	1	23.25334140	21.11	0.0001
X6	1	0.00462510	0.00	0.9486	1	11.79378285	10.71	0.0020
X7	1	0.06747962	0.06	0.8056	1	0.53432677	0.49	0.4865
X8	1	27.40657779	24.88	0.0001	1	27.03268483	24.56	0.0001
X9	1	0.25216386	0.23	0.6345	1	0.25216386	0.23	0.6345

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-398.45828220	-4.52	0.0001	88.07872360
X1	198.35495402	6.10	0.0001	25.95584243
X2	-38.16262276	-5.65	0.0001	6.75378927
X3	0.73631323	3.81	0.0004	0.19324033
X4	0.28681436	4.59	0.0001	0.06250681
X6	-0.00330456	-3.27	0.0020	0.00100985
X7	-0.00032702	-0.70	0.4865	0.00046951
X8	-45.43217475	-4.96	0.0001	9.15349282
X9	0.0000930	0.48	0.6345	0.00019435

Appendix 7 : Computer Print-out for R^2(excluding X_5) in Section 5.3.4 on Page 47

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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE Y

NOTE: SLENTRY AND SLSTAY HAVE BEEN SET TO .15 FOR THE STEPWISE TECHNIQUE.

STEP 1 VARIABLE X2 ENTERED R SQUARE = 0.70527010 C(P) = 108.26572084

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	1	422.39066941	422.39066941	129.22	0.0001
ERROR	54	176.51558059	3.26880705		
TOTAL	55	598.90625000			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	176.67828989				
X2	-36.56072876	3.21626873	422.39066941	129.22	0.0001

BOUNDS ON CONDITION NUMBER: 1, 2

STEP 2 VARIABLE X4 ENTERED R SQUARE = 0.82200920 C(P) = 46.78602610

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	2	492.30644528	246.15322264	122.38	0.0001
ERROR	53	106.59980472	2.01131707		
TOTAL	55	598.90625000			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	132.38091844				
X2	-27.93388068	2.95114879	175.07355875	87.04	0.0001
X4	0.38604951	0.06547804	69.91577587	34.76	0.0001

BOUNDS ON CONDITION NUMBER: 1.368316, 10.94653

STEP 3 VARIABLE X1 ENTERED R SQUARE = 0.84033709 C(P) = 38.82013955

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	3	503.28313572	167.76104524	91.23	0.0001
ERROR	52	95.62311428	1.83890604		
TOTAL	55	598.90625000			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	18.74136663				
X1	35.83504204	14.66760655	10.97669043	5.97	0.0180
X2	-43.88252365	7.26233786	67.14131337	36.51	0.0001
X4	0.36611743	0.06313866	61.85264586	33.62	0.0001

BOUNDS ON CONDITION NUMBER: 9.063125, 112.4039

Appendix 7 : Computer Print-out for Table 5.3 in Section 5.3.4 on Page 47

STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE Y

STEP 4 VARIABLE X3 ENTERED R SQUARE = 0.86726415 C(P) = 26.17797051

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	4	519.40992163	129.85248041	83.31	0.0001
ERROR	51	79.49632837	1.55875154		
TOTAL	55	598.90625000			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	-24.95208015				
X1	46.88443151	13.93420235	17.64696309	11.32	0.0015
X2	-47.10003074	6.76070074	75.65468904	48.54	0.0001
X3	0.73366579	0.22809345	16.12678591	10.35	0.0023
X4	0.35829082	0.05818085	59.11369260	37.92	0.0001

BOUNDS ON CONDITION NUMBER: 9.265976, 164.8618

STEP 5 VARIABLE X8 ENTERED R SQUARE = 0.88928240 C(P) = 16.20507278

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	5	532.59679018	106.51935804	80.32	0.0001
ERROR	50	66.30945982	1.32618920		
TOTAL	55	598.90625000			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	-243.11287389				
X1	113.21739435	24.65163178	27.97309064	21.09	0.0001
X2	-49.14925172	6.26976859	81.49599807	61.45	0.0001
X3	0.73824320	0.21039598	16.32786909	12.31	0.0010
X4	0.25909503	0.06220574	23.00714645	17.35	0.0001
X8	-22.07176398	6.99953110	13.18686855	9.94	0.0027

BOUNDS ON CONDITION NUMBER: 32.42806, 698.6339

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STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE Y

STEP 6 VARIABLE X6 ENTERED R SQUARE = 0.91250901 C(P) = 5.37530634

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	6	546.50734976	91.08455829	85.18	0.0001
ERROR	49	52.39890024	1.06936531		
TOTAL	55	598.90625000			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	-390.15726681				
X1	157.03157392	25.25061008	41.36314279	38.68	0.0001
X2	-37.87578257	6.43952220	36.99491482	34.60	0.0001
X3	0.71841626	0.18900697	15.45838936	14.46	0.0004
X4	0.27058830	0.05594961	25.01320042	23.39	0.0001
X6	-0.00283591	0.00078629	13.91055958	13.01	0.0007
X8	-44.75424110	8.89150256	27.09280303	25.34	0.0001

BOUNDS ON CONDITION NUMBER: 50.15497, 1323.996

NO OTHER VARIABLES MET THE 0.1500 SIGNIFICANCE LEVEL FOR ENTRY INTO THE MODEL.

SUMMARY OF STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE Y

STEP	VARIABLE ENTERED	VARIABLE REMOVED	NUMBER IN	PARTIAL R**2	MODEL R**2	C(P)	F	PROB>F
1	X2		1	0.7053	0.7053	108.266	129.8186	0.0001
2	X4		2	0.1167	0.8220	46.786	34.7512	0.0001
3	X1		3	0.0183	0.8403	38.820	5.9691	0.0180
4	X3		4	0.0269	0.8673	25.178	10.3460	0.0023
5	X8		5	0.0220	0.8893	16.305	9.9434	0.0027
6	X6		6	0.0232	0.9125	5.375	13.0082	0.0007

STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE Y

NOTE: SLENTRY AND SLSTAY HAVE BEEN SET TO .15 FOR THE STEPWISE TECHNIQUE.

STEP 1 VARIABLE X2 ENTERED R SQUARE = 0.69528744 C(P) = 38.42598648

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	1	156.14340618	156.14340618	55.90	0.0001
ERROR	31	86.58386654	2.79302795		
TOTAL	32	242.72727273			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	280.82175503				
X2	-60.19195612	8.05036095	156.14340618	55.90	0.0001

BOUNDS ON CONDITION NUMBER: 1, 2

STEP 2 VARIABLE X3 ENTERED R SQUARE = 0.77145009 C(P) = 16.19910573

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	2	187.25391891	93.62695945	50.63	0.0001
ERROR	30	55.47335382	1.84911179		
TOTAL	32	242.72727273			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	292.35939689				
X2	-63.04945829	6.58719694	169.40436308	91.61	0.0001
X3	1.16285326	0.28363990	31.11051272	16.82	0.0003

BOUNDS ON CONDITION NUMBER: 1.011311, 8.09049

STEP 3 VARIABLE X4 ENTERED R SQUARE = 0.81351793 C(P) = 10.24893361

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	3	197.45208928	65.82099643	42.17	0.0001
ERROR	29	45.26428344	1.56083736		
TOTAL	32	242.72727273			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	224.00434403				
X2	-48.03789814	8.43084923	50.57374489	32.47	0.0001
X3	0.99274452	0.26882403	21.28611862	13.64	0.0009
X4	0.19843114	0.07758818	10.20907038	6.54	0.0160

BOUNDS ON CONDITION NUMBER: 1.964258, 30.02471

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SUMMARY OF STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE Y

STEP	VARIABLE ENTERED	VARIABLE REMOVED	NUMBER IN	PARTIAL R**2	MODEL R**2	C(P)	F	PROB>F
1	X2		1	0.6433	0.6433	38.4260	55.9047	0.0001
2	X3		2	0.1282	0.7715	16.1991	16.8246	0.0003
3	X4		3	0.0421	0.8135	10.2689	6.5408	0.0160

STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE Y

NOTE: SLENTRY AND SLSTAY HAVE BEEN SET TO .15 FOR THE STEPWISE TECHNIQUE.

STEP 1 VARIABLE X6 ENTERED R SQUARE = 0.82719068 C(P) = 21.7834

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	1	139.36814279	139.36814279	100.52	0.0001
ERROR	21	29.11555286	1.38645490		
TOTAL	22	168.48369565			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	21.27715179				
X6	-0.00870295	0.00086804	139.36814279	100.52	0.0001

BOUNDS ON CONDITION NUMBER: 1, 2

STEP 2 VARIABLE X7 ENTERED R SQUARE = 0.91254613 C(P) = 3.6393

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESSION	2	153.74914435	76.87457217	104.85	0.0001
ERROR	20	14.73455110	0.73672756		
TOTAL	22	168.48369565			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	36.88886883				
X6	-0.01146072	0.00088382	122.49132131	166.26	0.0001
X7	-0.00838974	0.00086682	14.38100176	19.52	0.0003

BOUNDS ON CONDITION NUMBER: 1.973099, 15.78479

NO OTHER VARIABLES MET THE 0.1500 SIGNIFICANCE LEVEL FOR ENTRY INTO THE MODEL.

SUMMARY OF STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE Y

STEP	VARIABLE ENTERED	VARIABLE REMOVED	NUMBER IN	PARTIAL R**2	MODEL R**2	C(P)	F	PROB>F
1	X6		1	0.8272	0.8272	21.7834	100.5212	0.0001
2	X7		2	0.0854	0.9125	3.6393	19.9201	0.0003

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Appendix 7 : Computer Print-out for Table 5.3 in Section 5.3.4 on Page 47 Page 6 of 6


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